بسم الله الرحمن الرحيم

وَلَا تَقْفُ مَا لَيْسَ لَكَ بِهِ عِلْمٌ إِنَّ السَّمْعَ وَالْبَصَرَ وَالْفُؤَادَ كُلُّ أُولَٰئِكَ كَانَ عَنْهُ مَسْئُولًا

اسراء ٣٦

In The Name Of Allah, The Beneficient , The Merciful

And (Oh Man) Do Not Follow That Which You Have No Knowledge Of

Indeed The (Act Of) Hearing , And The (Act Of) Seeing,

And (The Proceedings Of) The Heart; All Those Will Be Enquired Upon

Qur'an 17: 36

GIDAJE : The Socio-Cultural Morphology Of Hausa Living Spaces

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ABSTRACT

Hausa architecture is an important part of African indigenous architecture. In many respects its construction techniques, its wall decoration and its structural forms, have been recognised as unique. Most of the Hausa Architecture studied has been in the form of palaces, mosques and few houses of the affluent, merchants and administrators . However the bulk of the Hausa built environment is, and for long has been, composed of ordinary domestic houses that accommodate the citizens of its cities and hamlets.

This work deals with Hausa architecture as found in the older parts a major Hausa urban centre; to wit the walled city of Kano. The Kano built environment is composed of several forms of architecture, but the main concern here is specifically with the *Hausa domestic architecture* in the walled city of Kano. The study is informed by the theoretical proposition that a correlation exists between the spatial organisation of domestic house and the social life of its inhabitants; consequently changes in one result in changes in the other and vice-versa.

The study has four main objectives ;to establish the basic characteristics of Hausa domestic architecture, i.e. its dominant spatial themes; to show how the resulting domestic environment is supportive of the Hausa-Islamic culture; to examine the cultural impact of colonialism on the concept of the dwelling unit and by extension, on the culture of the Hausa; and to broaden the data base of an indigenous knowledge system in the field of architecture.

The principal findings of the work are; that Hausa domestic architecture as found in the walled city is conceptually of two broad types; that the design concept of these types is rooted in the Hausa socio-cultural paradigm; that the design concept is flexible enough to cater for the sub-cultural elements that are the hallmarks of any Hausa society; that the changes in the political, economic and social fabric of the Hausa society in its recent history have had very little effect on the spatial quality of Hausa domestic architecture.

DEDICATION

This Work Is Dedicated To The Memory Of My Parents
Ahmad D Muhammad-Oumar 1920 - 1984
&
Fatsuma D Muhammadu 1926 - 1992
May They Receive Allah's Mercy

And To

The Nigerian Talaka, and The Nigerian Soldier for both are,

Much the same but made to appear different
Much Oppressed and little appreciated
Much Maligned yet little understood

May They Progress and Prosper

ACKNOWLEDGEMENT

It is almost impossible to enumerate all the people who in some way or another have helped or assisted me during the period of this study; from its inception to its conclusion. And no doubt none of them did what they did in anticipation of an acknowledgement, for many of them did not even realise the value of their help to me. However some must be mentioned here while the rest, for lack of space, are listed in **Appendix 22.**

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I was extremely lucky to be blessed with some of the best friends one could ever hope for. Two of them deserve to be mentioned first, for they are no more; **Dr. Salisu M Awwal** and **Alhaji Aminu Hassan**. Its my fate that their respective deaths marked the beginning and the end of this work. *Masha'Allah.* May Allah have mercy on their souls.

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One friend stood out as doing more to me than I can recount estimate or ever hope to repay. He combines in himself qualities that are rare to find even among blood relations let alone a friend; **Mallam Abubakar Wada.** He is indeed a true friend, a dear colleague and a person beyond compare. To him I owe so much, that I would perhaps be indebted for the rest of my natural life. He too knows what he knows.

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AbdulRazzaq

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PART ONE : OF TOTEM PIPES AND REED

Read! Read! And Read!

Of Him Your Maker Read

For All Your Human Needs

Of Love And Happiness; Plead

But Gold And Power Heed

That None Shalt Harm Your Deeds

Read Right, And Read

That You Of Id May Weed

Of Totem Pipes And Reed

That Blow Conceit And Breed

Ignorance Crass As Creed

And Foster Nought But Greed

Read! Write And Sow Your Seeds

For Us And Them; For All Our Future Needs

(**Reflections IX** AA Muhammad -Oumar 1982)

CHAPTER ONE : INTRODUCTION

1.1 African Domestic Architecture

Of all forms of architecture none is more common and pervasive as that which accommodates the family[1], the smallest social entity . But domestic architecture has had a small place, if at all, in the customary chronological treatment of the study of architecture undertaken by architects and historians of architecture. Pevsner's monumental **A History of Building Types** published as late as 1976 did not have a single paragraph on domestic buildings in its over 350 pages. Pevsner may have his reasons for not treating domestic buildings, but that this is so, in a book that became a standard text in many schools of architecture, is indicative of the general trend of affairs as regards this type of building.

At the turn of this century much had been acknowledged of what was then termed vernacular architecture, especially the English rural vernacular as a form of architectural inspiration. This acknowledgement however, was basically, though not exclusively, in respect of architectural ' detail'. For instance, " a well thought out and proved junction between, say, two materials or between a wall and a roof corner, or the solution of a valley in the roof and the ridge can, if extended throughout the whole building, become the basis of design." Or, "if the solution to a detailed problem could lead to a style.....the way......that detail is solved ......suggests whether the architecture is good or bad, true or untrue, valid or invalid." (Nuttgens 1988. :42-43).

Domestic architecture has long been the concern of geographers who related human habitation to geographical and technological factors (Guidoni 1978; Duly, 1979), or what is termed ecological determinism, to the almost total exclusion of the socio - cultural factors.[2] Anthropologists (Morgan 1881; Durkheim & Mauss 1902; Leroi-Gourhan 1945) were the first to point out how important local architecture, most especially its houses, is to the understanding of any civilisation. This is why when African indigenous architecture was first given attention, it was in the context of the habitations of the subjects of anthropological studies by anthropologists, who were well aware of the importance of local architecture as, " an index to the structure of the family occupying it" (Fortes 1949:50), rather than by architects.

Attention to the so called ' non- pedigree architecture' became more serious with the end of the Modern Movement some time in the late 1960s (Nuttgens 1988 :1). The Modern Movement's fundamental assumption was that architecture could and should be a vehicle for positive social

---

[1] Not all houses accomodate families, nor do every family reside in a house ; both words are used in the generic sense. See below on family, household and houses.

[2] To be fair not all geographers had this orientation or inclination. Some, notably French geographers, were among the first to point out the fallacy of this ecological determinism; See Tofin (1994).

reform. Theoretically it held that architecture could and should serve, to improve the social status of the masses as much as it could for the privileged. Practically it sought to provide meaningful architecture for all at the lowest possible cost using the technological means available. But by the beginning of the 1960's it became clear that it was, " an architecture of social concern without personal understanding" (Nuttgens op.cit. : 209). This loss of faith led to criticisms and critical comments by professional architects (Venturi 1977; Watkin 1977; Schnaidt 1967 & Allsop 1977), and the general public. Consequently there began a search for another theory of architecture through an understanding of the socio- cultural conditions in which it is generated. The view of architecture as the domain of the genius began shifting to what Rudofsky (1965) termed, 'architecture without architects'; viewing architecture not in terms of norms, e.g. the ideal section, but architecture as a product arising from social process; not as problem solving but as response to the socio-cultural needs of the users.

It was as a result of this shift that in the 1970's African indigenous[3] architecture, which until then has not been regarded as worthy of serious study, began to be noticed academically, although other forms of African art, especially sculpture have been for long been subjects of serious studies. That African indigenous architecture was academically shunned[4] could be explained by theoretical, expedient and preferential reasons (Prussin 1986). First there is the problem of definition (Ladd 1973:417) ; What is architecture? The dominant paradigm defined architecture in terms of permanence, monumentality and originality, even though only a minute proportion of the built environment fits this definition in any epoch and milieu, modern or ancient (Rapoport 1969; Pevsner 1976 Oliver 1987); This will be addressed in more detail elsewhere in this work.

Secondly, the relationship between buildings and occupants had been largely the concern of other than architects; anthropologists, psychologists and sociologists etc. (Lawrence & Low 1990). Third, made largely of transitory albeit rich building materials, these buildings are deemed not capable of lasting or being preserved, long enough to trace the development of style or type; essential aspects of architectural historiography (Pevsner 1976:2).

Finally there is the ethnocentrism usually associated with conquering peoples and consequently African indigenous architecture was regarded as " primitive" (e.g. Gutkind 1953; Read 1965), with all the associations that go with the word. This has become so deep rooted that *it is still* difficult to convince some, including Africans, of the fact that an African Architecture exists (Bourdier & Minh Ha 1985:205 ; Prussin 1986:3). This aside, the fact of the matter however is as Bourdier and Minn-Ha lamented," the diversity and elaborateness of African vernacular

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[3]. There are several terms for the kind of architecture being discussed here ranging from the derogatory 'Primitive' through 'Folk' to 'Vernacular' and 'Indigenous'. While each has its merits and demerits none accurately captures the essence of the architecture in question because as one scholar puts it, "no single characteristic can be sufficient for defining categories, i.e. classification. One needs a large number of characteristics and a polythetic rather than monothetic approach" (Rapoport 1990:73). For an excellent discussion on this subject see Oliver P (1976:11 -12)

[4] Of course there had been exceptions, eg. Beguin 1952. But these were few and far between.

architecture remain widely unknown," and "...(the) variety of design principles and adapted building techniques.....belie the widespread image of the primitive hut so readily attributed to rural Africa" (op. cit. :2)

When African indigenous architecture first began to be looked at academically by other than from purely anthropological views it tended to be following geographers. That is in the light of solutions to physical factors, namely climate, topography, construction materials and level of technology. The results were wide ranging surveys leading to generalisations and oversimplifications on indigenous architecture's multi-various nature and characteristics, despite the rich diversity of cultures even within such a small area of Africa as the political entity called Northern Nigeria. Again there are exceptions (Bourdier & Minh-Ha 1985), but by and large this has persisted (Hull 1972; Denyer 1978). Thus a serious void existed, and still does, in the study of African indigenous architecture in general, and African indigenous domestic architecture in particular.

One of the first works, and by far the most influential to make a strong case for the serious study of the non-pedigree, non-western architecture and environment was the now classic work of Amos Rapoport, **House Form And Culture** (1969). The basic premise of this work is that there is a link between behaviour in specific terms or culture in general terms and built form of a given milieu. Rapoport was able to demonstrate the inadequacy of the then current theories of the form of the built environment, from climatic determinism through material/technological explanations to theories of social factors, like defence and economics, and concluded that," house form is not simply the result of physical forces or any single causal factor, but is the consequence of a whole range of socio-cultural factors, seen in their broadest terms" (ibid. :47).

To further buttress his arguments Rapoport introduced the concept of criticality : that is each of the forces that affect house form could be ranged from the most restrictive in terms of choice or the most critical, to the most permissive, giving greater freedom of choice or the least critical. Rapoport's main thesis is that socio-cultural forces have the higher criticality and thus primacy, over and above physical forces and hence affect house form more (ibid. :59). As a pioneer work Rapoport's work was by necessity seminal, extensive and simple in that even his key terms are not clearly defined. For example one would expect that the word 'form' would be given special attention. Is form to be understood in terms of shape or morphology ? It seems Rapoport uses the word in both senses. Yet although a relationship may be shown between morphology and shape, clearly morphology is influenced more by culture whereas shape is influenced more by materials, construction and technique. Of course one could argue that the selection of materials is also cultural, but up to a limit. Despite all its shortcomings this was a tremendous work and perhaps it set the wheel rolling toward a shift in architectural outlook.

Within African indigenous architecture, Hausa architecture has been recognised as unique in many respects; its construction techniques (Daldy 1945 ; Moody 1967; Moughtin 1985), its wall decoration (Kirk-Green 1964; Heathcote 1971) and its architectural elements (Prussin 1976 &1986). However in the true tradition of the dominant paradigm, the architecture of the Hausa studied has been in the form of palaces, mosques (Dmochowski 1990), and a few houses of the affluent, merchants and administrators (Foyle 1951 and 1952). But the bulk of the Hausa built environment is, and for long has been, composed of ordinary domestic houses that accommodate the citizens of its cities and hamlets.

This work aims to study Hausa Architecture; specifically it will be concerned with *Hausa domestic architecture* as found in the older parts a major Hausa urban centre; the walled city of Kano. This needs some elaboration. Today, like every major city in Africa and elsewhere in the so called 'third world', the Kano built environment is composed of several forms of architecture; architecture as built by the indigenes but not of them; architecture as built for the indigenes but not by them; and architecture of the indigenes, built by the indigenes and for the indigenes. The first category is usually " pedigree " architecture with all the mod-cons which, invariably is the prerogative of the elites, usually located in new lands well away from the older parts of the city; the second is usually the government sponsored or institutional housing and services schemes, for instance markets; the third is almost invariably non-public, non-institutional and non-commercial private residences of the majority of the inhabitants.

This last category of domestic architecture has been studied only in passing. One could say with little fear of contradiction that the ordinary houses of the Hausa have never been studied in depth. For this little could be said about their architectural layouts, and even less on their socio-cultural dispositions. One would find it hard to make any definite statement about , for example, the generic and the differential forms of actual houses, as opposed to prototypes. Again not much could be said on the way real Hausa houses are lived, perceived and related to by the inhabitants.

Concern with ordinary Hausa houses in their existential[5] nature is the driving force behind this work and hence the focus on the walled city. It is an attempt to address the imbalance in the study of Hausa architecture, which so far tends to ignore the common domestic environment and tends to focus on the houses of the nobility and the elites.

Old Kano city is selected as a model Hausa city for three major reasons;

a. It represents a typical example of a homogeneous[6] Hausa cultural environment (Whittlesey 1937; MacDonnel 1964 ; Main 1988; Frishman 1977).

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[5] In the ordinary rather than the philosophical meaning of the word.

[6] It should be noted that a Hausa society is by definition heterogeneous since it contains not one but several tribal / ethnic groups that share certain group affinities. The homogenousness of a Hausa society is to be understood only in terms of co-location, common religion and common language. See Usman (1973) on the concept and importance of co-location among the Hausa.

b. It is a Hausa urban milieu par excellence due to its historicity and its socio-cultural complexity (Mortimore & Wilson 1965; Paden 1973; Yahaya 1983)

c. A good portion of it has remained intact, i.e. has not changed much from its initial conception (Frishman 1977; Mohammed 1980; Main 1988).

However it must be stated here that Kano is not unique in displaying these urban characteristics. The distinguishing elements can be identified in the other major Hausa cities such as Daura, Katsina, and Zaria (Hill 1976; Schwerdtfeger 1982).

1.2 Thesis Format

This work will be in three parts. Part one will deal with the basic questions, i.e. what is to be studied and why is it studied ? To this end it will consist of four chapters including this introductory chapter.

The second chapter will deal with the raison d'être of the study as well as discuss the state of scholarship on Hausa architecture. It will end with the aims and objectives of the study as well as touch on the anticipated results. The third chapter will deal with the research setting; it will discuss the ethnology and the ethnography of the Hausa and the Kano urban spatial characteristics. The last chapter of the section will deal with the research methodology including an overview of the approaches to the study of domestic architecture. It will also define the basic assumptions and limitations of the work and end by describing the fieldwork format.

Part two of this work will deal with the presentation and analysis of the data collected during fieldwork. There will be four chapters; the first will present the data on the 160 houses in terms of size and certain social characteristics. The next three chapters will deal with the analysis of the data by looking at the physical, the socio-cultural and the syntactic aspects of the houses, respectively.

Part three will deal with the findings and explanations thereof. It will have a single chapter which will delineate the major characteristics of the houses as elicited by the analysis and an attempt at explaining them, . It will also be a summary of the major findings and conclusion and will include the theoretical framework or the abstraction of principles to guide design.

CHAPTER TWO: THE PROBLEM

2.1 The Study Of Domestic Architecture

Of all building types perhaps none is more relevant to every man, however humble and unprivileged, than domestic buildings, the ordinary houses of the ordinary people, because it is an architecture that served everyone and with which everyone can relate to. Yet for long this category of building has had no place in the fabric of architectural thought. This as mentioned in the introduction, has to do with the question of definition, a question which , one dares say, still raises a lot of dust, as well as the question of dimension . But first the question of definition; What is architecture? How can we recognise and distinguish architecture from other aspects of the built environment? Is every building an example of architecture or are only certain buildings qualified to be termed architecture? Is architecture a product or a process?

A standard definition of architecture invariably dwells on uniqueness , for instance Pevsner defines architecture thus; " a bicycle shed is a building. Lincoln Cathedral is a piece of architecture....the term architecture applies only to buildings designed with a view to aesthetic appeal " (Pevsner 1943 :2). This definition of architecture, one among many, implies such concepts as aesthetics, taste, quality etc., that are by and large subjective. This idea of the concept of architecture could be traced to some misinterpretation of Vitruvius who in the earliest known work on architecture[7], stated three aspects of architecture that are of prime importance, ***utilitas; firmitas ; venustas*** : i.e. utility, firmness and delight . This concept, revived during the Italian renaissance has ever since dominated, if not dictated the concept of architecture;what it is or should be. Architecture in the West is invariably associated with art and for some it is art par excellence.[8]

That all buildings have utility was never in doubt , but that they are firm - meaning they are durable (Vitruvius, trans. Morgan 1960:17) and are significantly beautiful or delightful - has been the moot point. This is because these terms involve subjective judgements of qualities that are very difficult to define. However as Rybczynski (1989 :4) noted even a bicycle shed is designed with some aesthetic appeal in mind, let alone a family dwelling. Again isn't the shed durable, in the sense that it lasts as long as the bicycle which it houses ? Is it always necessary or even desirable for a building to out last or even last its use? In many parts of Africa, for example, a building that survives certain times and persons is an embarrassment rather than an asset. Thus setting the time scale of firmness or durability is equally subjective, unless we accept as architecture, only those buildings that survive the ravages of time and fashion. What constitutes

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[7] Vitruvius **The Ten Books of Architecture** Translated MH Morgan (1960) Dover

[8] The great Spanish architect Antonio Gaudi is reported to have said," architecture and music are the arts of space and time....Architecture is the music of space and music is the architecture of time.' (Nuttgens 1988:33)

architecture then would be a fraction [9] of what the existing environment holds at any given epoch and clime. If this is accepted then we have the problem of assigning importance to whatever survives and consequently some significance that in reality it may not possess, to the detriment of all that did not . In addition we end up with a distorted view of what obtained in the past. Like written history, "it tends to concentrate on a few striking personages and events at the expense of commonplace reality," (Glassie 1975:10).

Looking at domestic houses then permits us to have a more comprehensive view of the architecture of a given milieu and since, "the house.... is a microcosm, reflecting in its layout, structure, and ornamentation the concept of an ideal natural and social order......(it becomes) ....a useful means of encoding such information," (Waterson 1990: xvii:). If well analysed this will render invaluable information that conventional historiography has not and could not be able to render. (Glassie 1975;14 Rapoport 1990: 23).

Thus the study of domestic houses is not the anti thesis of the study of the monumental and the permanent but its complement since, " even 'monuments'...only make sense in their contemporaneous setting" (Rapoport 1990:72) . We hasten to add here that it should not be taken that there is no difference between the house of the rural farmer and the Taj Mahal. Our contention is that such differences are of degree not of order. While the former follows, " the tradition of people as found in particular places, ...the latter (follows) the academic rules understood by a cultured few ..." (Brunskill 1981:22).

The question of dimension has also hampered the development of this field. For long domestic architecture has found no place in the schema of architectural study because by virtue of its size, it is considered too simple for serious study. Simpson & Lloyd (1977:7) reported that as late as 1971 Chapman had to lament, " there has been nothing on housing beyond an article or two in academic journals and a few pages in more general works". Fortunately with time the complexity of domestic architecture, the *Cinderella* of architectural studies, as one scholar recently named it, became obvious, resulting in ," an ever growing academic output which includes a wide range of interdisciplinary approaches " (Trigueiro 1995:53).

The study of the domestic house is important in many other ways. First it could be a means of tracing the social history of the milieu. The nature , size and disposition of the populace is closely reflected in the houses that accommodate them. Population growth and intense economic enterprise often resulting in urbanisation are usually reflected in housing conditions; the growth of urban slums for instance. So is the case with class differentiation and its resultant social stratification. Houses express the regional personality; the 'collective unconscious' , if you will, the result of the

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[9]Rapoport (1990:25) has estimated that Western tradition of architecture deals with," at most 1% or 2% of the built environment for a small part of the world over a relatively short time span; it also looks at a few selected buildings.." Earlier Oliver (1987) surmised that even a global figure of 1% is a gross overestimation.

direct influence the folk exert on their environment. It is for this reason that most of the pioneer works on domestic architecture were done, as noted above, by social anthropologists.

Secondly, it is not difficult to reconstruct what the elites, the kings, princes and generals of many a society did or thought. There is wealth of information about the grand culture of any epoch and clime, but almost nothing significant about the ordinary, the common place, the elements of history if you will [10], which form the vast majority. For this group of people what they left behind in terms of artefacts is perhaps the best means of understanding their milieu and the house, as an artefact , common, numerous and associated with time and space, is one of the best means of understanding a culture since its an expression of it. Analysis of domestic architecture is one means of studying synchronic account of the past era, recent as well as distant (Glassie 1975: 8-12). It is for this fact that archaeologists and folklorists turn to the study of domestic houses both existing and collapsed.

Thirdly, houses constitute a barometer of changing architectural taste and attitudes. Unlike the case of monumental architecture, in domestic architecture, the predominant form of indigenous architecture, such changes occur over long periods of time as a result of small additions and or modifications to the traditional rules of design, or what Glassie (1975 :17) terms community competence ; i.e. construction techniques, building components, decoration, and furnishing etc. Such architectural details perpetuate customs and usage long after the origin and bases of these are lost. Thus the development of local or regional architectural styles could be more appropriately traced in domestic architecture rather than in the monumental architecture of a palace.

Fourthly, the way domestic houses are erected and maintained has a direct bearing on their functional requirements and utilisation in relation to their context which naturally, differs from place to place. It is in this vein that sociologists see domestic houses as second only to the society's religious buildings and observances, in reflecting the social organisations of the milieu (Hill 1974), while geographers see evidence of the significance of local geographical factors in the form and development of domestic houses (Toffin 1994:11).

Fifthly, the housing need of the world at large is far from being satisfactory even in the most economically advanced nations. In the so called ' Third World' which forms 75 % of the global population, housing condition ranges from the pathetic to the disastrous. Part of the problem lies in the number of houses and their physical conditions. This results in housing schemes by governments the world over, most especially in the urban or semi-urban centres. However the major problem is in getting these houses to ' fit ' the users; i.e. to fulfil the socio-cultural requirements of those that are to make homes out of these houses.

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[10] In the words of a contemporary leader, " It is not the king or general that make history but the masses of the people." Nelson Mandela ANC rally Soweto 19 February 1990.

The need to design and build appropriate houses is therefore imperative for the survival, well being and progress of human kind. But, while the ability to construct well, given the technological know-how, is the domain of economics, the ability to design well is the domain of the architect. Yet globally, architects have been widely criticised and accused of failure, thus far, to provide users of different cultures with appropriate housing forms. This, as has been pointed out by many (Michelson 1968; Brolin 1976; Newman 1980; Aradeon 1981), partly had to do with the basic theoretical propositions of the contemporary architectural thought early in this century. The dominant paradigm then, by and large advocated an international style transcending any and every socio-cultural factor. In some quarters this philosophy still persists. Partly, it has to do with the inadequate understanding of the cultural principles behind architectural phenomenon of a milieu on the part of architects. But in order to design appropriately, architects need not only to understand but, be familiar with the culture of the end users of their work. The study of domestic houses is one way of remedying this lack.

Finally it is through such studies of architecture that important cultural markers are identified by commissions for historical and cultural monuments. Such data may be used for the purposes of restoration, rehabilitation and revival of material culture ; buildings being cultural artefacts par excellence (Muhammad~Oumar 1992: 1).

2.2 Hausa Domestic Architecture : *State Of The Art*

The Hausa are the most populous and arguably the most important single ethnic group[11] in Africa south of the Sahara. In Nigeria alone they number about 30 million in 1990 and there are substantial populations in other West African countries notably , Niger, Ghana, Cameroon and Chad (Adamu 1978). The Hausa language, as the language of commerce and enterprise, is the most widely spoken language in the whole of Africa other than Arabic and English. More importantly the Hausa have been famous for their architectural forms; their construction techniques and their wall structure and decorations. Building mainly with moulded lateretic clay the Hausa builders are the only ones in the entire West African savannah to fully develop the art of construction with adobe (Urvoy 1955:30). Not only that , they," excel in the use....(of).... sculptural relief for both the interior and exterior of surfaces of buildings" (Sa'ad 1984:3).

The bulk of Hausa architecture is in the form of the ordinary domestic house. In the old city of Kano for instance it was estimated (Trevallion 1967:47) that in 1962 there were about 28,000 domestic houses . Unfortunately to date there is no single comprehensive work that deals in depth with the domestic architecture of these important people. Most of what is known about Hausa domestic architecture is implicit through works that deal with some aspects of architecture from

[11] Strictly speaking the Hausa are not an ethnic group, rather they are more like a linguistic group. For an elaboration of this subject see the discussion on Hausa ethnology (infra **Chapter 3**) .

various disciplines : anthropology, archaeology, art appreciation, economics, geography, planning, sociology, and general architecture.

Logan (1929) was perhaps the first to draw attention to the unique characteristics of Hausa Architecture. The first work on Hausa architecture to gain widespread renown, is the technical manual of Daldy published in 1941. In it, construction materials and techniques (including a vocabulary of words and terms) used by the Hausa master builders were described and elaborated upon. However despite its acknowledgement of the skills of these builders and the viability of the techniques used by them , the author never considered what he was dealing with as an aspect of architecture. This is clear from the title of the work[12]. It seems that the author was more concerned with the expenditure incurred by his department in maintaining these buildings rather than in appreciating them as works of architecture.

The first works to deal specifically with domestic architecture were the two seminal works of Foyle (1951 & 1952). But in the true tradition of the concept of architecture then current, these dealt with the house of a rich merchant in the Kofar Mata ward of the walled city and, the official residences of the colonial British Resident and the District Officer in Kano, respectively. Aside from the fact that these were by no means typical houses as found in the city of Kano, the works were mainly descriptive and technical and lacked any social content which is a pity. In his later work Foyle (1959), dealt with the general architecture of the region rather than domestic houses despite urgent pleas by some of the users of these houses (Mussom 1952:266-268).

Schwerdtfeger in two well known works (1971& 1982) focused on Zaria, one of the major Hausa cities. His works were the first, and perhaps the only to deal with Hausa domestic architecture in depth. In general he was concerned with housing in all its aspects from production through perpetuation to reproduction. Specifically he traced changes in domestic house form as a result of changes over time, in family group composition. He found a direct relation between changes in family size and composition on one hand, and changes in domestic house construction, and concluded that the ability of the family group to chose and alter house form to suit their needs, is contingent upon the prevailing socio-economic forces well beyond the control of the family group. Although Schwerdtfeger is an architect , his works were more inclined towards anthropology perhaps to the detriment of architecture itself. The reason for this is simple , as he himself admitted. " My basic interest centred on the relationship between co-residential kinship groups and the layout of their houses" (1982:311). Despite this emphasis, much could be gleaned from his works about the use of spaces in the houses he studied. To date hardly any work on Hausa domestic architecture has achieved its level of scholarship.

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[12]This work is titled ' **Temporary Buildings in Northern Nigeria** ' despite the fact that some of the buildings being maintained by the Public Works Department in Kano were more than 200 years old!

Labelle Prussin is currently one of the leading authorities on West African architecture. In several works (1968; 1969; 1970; 1974; 1976; 1980; 1986; 1990), stretching over two decades, she has extensively surveyed the architecture of the region in its various aspects, from its history through its construction techniques to its socio-cultural basis. In its basic premises Prussin's treatment of her subject matter is extensive and varied rather than specific and focused. Consequently domestic architecture is not explicitly discussed except in passing. But what she lacked in terms of specifics she more than made up for in terms of insight . Prussin stands out because of the tremendous effort she puts in theorising about the origin and development of the architecture of the region. In this she is unique for none has done more nor even as much. Working with scant and biased written records, oral traditions rich in legends and myths, and mutable and perishable artefacts, Prussin attempted to, in her words," paint a panoramic canvas rich in insights not only for Africa but for the world" (1986: xx-xxi). Where others hesitate she pushes forward; while many tread lightly she marches full speed; and where not quite a few prevaricate she is uncompromisingly forceful.

But in her attempt to be theoretical, she is many cases prone to sweeping statements and generalisations. Thus she speaks of the 'Fulbe architectural tradition' (1986:199-204), and then goes ahead to describe only the Fulani mat frame. This except for appearance, does not differ much from the Songhai mat frame to the west, nor from the roof structure of the Nupe hut to the south. She suggests that the final form of the West African courtyard house, is traceable to the Roman atrium house as filtered through North Africa, under Islamic influence (1986:105 & 200). No critical evidence is offered to support this other than trade links between the three regions. This is faintly reminiscent of the diffusion theories of the late 19th. century since there is the possibility that this form may have predated Islam. This Prussin did not even broach.

Another difficulty encountered with some of Prussin's works, lies in some of her assumptions that go against certain socio-historical facts . A good example is in her treatment of the origin and development of what she terms Fulani-Hausa architecture, which itself is a misnomer (Usman 1973). Prussin accepts that the form of this architecture is unique in the whole of Africa and even acknowledged the Hausa builders as skilled earth workers who," were indeed instrumental in (the) development (of this architectural form) " (1976;14 & 1986:200). However she proposed that the origin of this form of architecture lies in the nomadic 'Fulbe building tradition' (1986:206) , another misnomer. Prussin's explanation is that the Fulani, a nomadic people, initiated a revolution which lead to the conquest of the Hausa, a sedentary agricultural people, and adapted their tent form on to earth walls of the Hausa (1976:15).

Two facts go against this theory. First, the structural principle behind the Hausa *baka* or arch, differs radically from that of the Fulani mat frame tent. While the Fulani frame works on the principle of tension , the *baka* works on the principle of compression (Daldy 1945; Sa'ad 1981). Second, the Sokoto Jihad that brought the Fulani to power began mid 1804 and it was not until the end of 1808 that Hausaland was subdued by the Fulani, yet Clapperton who visited the Kano seat of government in 1826, writes of the residence of the King as having, " several towers three or four stories high with windows in the European style but without glass or framework".[13] (1826:253) . The German traveller Hienrich Barth who visited Kano in 1851 left a vivid description of the architectural detail of the King's reception hall with its huge arches and magnificent ceiling[14] (Barth 1965: 494). Another German, Paul Staudinger made a similar observation in 1885 (Moody 1967 : 41- 42)[15]. To accept Prussin's theory would be to accept that the mat frame form was transformed into the *baka* form and, this was achieved by the nomadic Fulani over a period of less than a generation of the subjugation of the sedentary Hausa. While this is not entirely impossible, it is highly improbable.

Prussin herself would accede to this argument for in her incipient *opus*, **Architecture In Northern Ghana** (1969), while discussing the high technical quality of Tallensi buildings she was emphatic that the high level of building proficiency exhibited, "suggests that the internalisation of a building process particularly appropriate to the physical environment *has had a long history of maturation*, (emphasis not in the original) lending, '...support to ...extended residence in the area" (Prussin 1969:58). If this is accepted, then it is not difficult to accept that another Negroid people, the Hausa, could achieve an even more spectacular technological breakthrough without the impetus of the Hamitic Fulani.

Prussin is one of the most influential authorities on Fulani-Hausa (sic) architecture and her ideas keep being repeated by subsequent writers to the detriment of a good understanding of Hausa architecture. For instance her example of a Hausa domestic house (1986:215) is nothing but a modification of the *sketch drawing of a rural Hausa house* drawn by MG Smith in the introduction to the work of his wife MF Smith (1954: 36).[16] The Smiths were anthropologists and their sketch could be pardoned, but to reproduce it by an architect and present it as an example of domestic architecture from urban Kano is to say the least sad. It is even sadder that almost a decade later the same diagram is still presented as an example of an urban Hausa domestic architecture .

The work of Moughtin on Hausa architecture (1985) is broad based incorporating planning, construction and decoration. Here again because his aim is to, " determine those elements of urban

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[13] Of the ordinary houses in the city , Clapperton writes, "the houses are built of clay ...mostly of a square form.....with a central room, the roof of which is supported by the trunks of palm trees, where visitors are received" (ibid: 252)

[14] Barth wrote," The Govenor's hall was very handsome, and even stately for this country, and was more imposing as the rafters supporting the very elevated ceiling were concealed, two lofty arches of clay, very neatly polished and ornamented, appearing to support the whole" (p494)

[15] Staudinger was impressed by the Galadima'sreception hall of which he wrote, " This was a large high domed building". But he was overwhelmed by the King's reception hall which was, "a huge hall spanned by a mighty cupola.....the middle decorated by a large shiny brass basin , obviously meant to symbolise the sky with the heavenly bodies".

[16] This sketch shows remarkable similarities with the drawing of an example of one of the houses of the Moundang people of the Cameroons (Beguin 1952 : 50). See **Appendix 10**

structure which seem to be of more lasting importance ......than the transitory beauty of architectural fashion"(ibid. :3), the work is more like an introduction to Hausa architecture rather than a detailed study of it or an aspect of it. As a planner naturally his biggest contribution is in tracing the development of the Hausa settlement (ibid.: 29-54) and in its broad based approach this was a good work. However in its attempt to trace the origin and development of this architecture, the ideas presented were mere assumptions unsubstantiated by historical facts. The penultimate chapter of the book, titled 'Architectural derivatives' is more speculative than factual. Statements are made without substantiating evidence. For instance it is surmised that, " new ideas from outside (Hausaland) introduced from time to time" (ibid. :149) were responsible for the final form of Hausa architecture. Also, the mud wall though developed in the West Africa Sudan," is more likely to have been imported from more advanced cultures" (ibid. :150).

Despite this, Moughtin is one of the few scholars of Hausa architecture to realise its complex nature and bold enough to advocate for a concerted policy that will allow it to become relevant in the contemporary life of the Hausaman (1984:333).

The most accurate and perhaps the most detailed work on Hausa architecture to date, is perhaps the work of Sa'ad (1981) . In its thesis , presentation and treatment of subject matter it makes a unique contribution to the study of Hausa architecture. Sa'ad's main thrust was in trying to understand the role of the individual creativity of the master builders of Hausaland in the origin and development of their architecture. He was able to demonstrate not only how the character of the master builder differs from that of the ordinary builder, but also the elan vital behind the design process of the master builder. This work is full of details on some important aspects of architecture that have implicit bearing on the study of domestic architecture, for example scale; perceptions of space; use of space; symbolic meanings etc.

The most recent work on Hausa architecture is the posthumous work of Professor Dmochowski (1990). The volume which deals with the architecture of the north is most relevant to this discussion. As an introduction to the architecture of the Hausa this extensive work is unparalleled in its technical treatment of different aspects of the Hausa built environment. Buildings of various types including domestic houses, are described and documented with the aid of detailed sketches and photographs. By its very nature this is more of a survey work than a detailed study of the domestic architecture of the Hausa. The few houses dealt with were more in the tradition of the monumental and intriguing rather than the ordinary.

Other works that indirectly deal with Hausa architecture and or spatial culture are the works of Trevallion (1966); Hull (1972); Hill (1977);Frishman (1977); Denyer (1978) and Nast (1992). Two of these works were concerned with planning, two were sociological , one dealt with the spatial growth in relation to the economy and the last was geographical . Hull's work dealt with pre-colonial settlements in Africa. It was an extensive survey of the nature and development of

African settlements in general. Consequently his discussion of Hausa architecture was only in relation to town planning and even then it was extremely restricted. Trevallion dealt specifically with the 20 year development plan of Kano metropolis. Although this work is replete with valuable information about the domestic architecture of the city; its types, dimensions, conditions, occupancy rates etc. etc. , it did not consider the social nature of domestic architecture in any significant detail.

Hill's work surveyed a suburban Kano settlement. As a sociologist Hill was more concerned with social institutions, problems and solutions, hence all the information on domestic life was discussed in this light rather than in architectural terms or details. Moreover the settlement in question even though close to the city, was more rural than urban. For this reason the findings of the work would be much more useful for comparative purposes rather than for the study of a Hausa urban milieu. Yet a lot could be gleaned in terms of kinship, economic activities and social status, all of which are important aspects of domestic family life.

Denyer's work (1978), is another survey that covers the whole of Africa like the work of Hull discussed above. It sought to establish the characteristics of building types, and a taxonomy of building forms using historical and geographical perspectives. The work is extensive and full of generalisations, even though she testified that, " one of the most frequent sources of error on questions of African architecture....is the tendency to generalise from a very narrow base of experience (ibid. : 6). Theoretically it has not much new to its credit. The little that is said about Hausa architecture does not bear much on its domestic houses.

In his unpublished work Frishman (1977) dealt intensively with the spatial growth of the Kano metropolis. His aim was to study the form and structure of the Kano spatial distribution in order to find," the general principles guiding the distribution of activities and the relationship between their relevant variables." (ibid. :1), and the factors that influence their locations. He was able to identify the spatial characteristics of the city as well as trace its growth and development over a period of almost a thousand years; from the inception of the first indigenous kingdom to the end of 1973. Frishman concluded that the form and structure of the Kano urban area," does not exactly resemble any of the pattern found in the urban areas of Europe and America (ibid. :382). Overall he was successful in demonstrating the strong socio-cultural factors responsible for the urban form of the city.

Although its orientation is economic, with emphasis on the land tenure system and government land control policy - factors that affect and, are influenced by economic activities - yet, some of the findings of this work may have bearing on the study of domestic architecture. For example the fact that it is the strong social and religious ties that keep families and clans near one another rather than economic ties (ibid. :392); so also the fact that the built up area of the walled city of Kano has throughout its history, maintained a direct relationship not only to the peak population of the city but also to its open unbuilt area.

Nast's dissertation (1992) examined the geographico-historical relationship between space, gender and power in the palace of the Emir of Kano from pre-colonial times to the present. Her conclusions were that traditional spaces are gender oriented and that this orientation did not change as a result of colonialism which brought about an entirely new political orientation. What did change however was spatial restructuring to facilitate greater visual control and hence the observed increase in building linearity and spatial axiality in the palace. By its orientation this work dealt with an institutional residence rather than that of the ordinary folk and hence many of its findings may have no relevance to the study of ordinary domestic architecture.

Before concluding this section it might be profitable to look at three works that deal with African domestic architecture other than that of the Hausa. These are the works of Prussin, Oliver and Bourdier and Minh-Ha. **African Spaces** by Bourdier and Minh-Ha (1985) presents case studies of 10 distinct but related Gurunsi rural settlements in modern Burkina-Faso. For each settlement a socio-historical summary is given and then a compound is selected for detailed analysis. Using detailed drawings - plans, elevations, sections - and photographs, the compound is dissected giving details of spatial arrangement, use of space, construction techniques, furnishing and decorations. Where appropriate, symbolic and social aspects of certain design features are commented upon. For example the circularity of the Eastern Kessena compounds allows the inhabitants of the compound to subject, and thus control, guests - especially unrelated males - who might venture into the compound to a circular field of vision (ibid. :143). Overall it shows the congruence of the house forms and their socio-cultural milieu. In this sense it is one of the most sympathetic works on African domestic architecture. Its graphic presentation is commendable. Its treatment of a single compound in a community, however representative it might have been, could be restrictive if not selective, for it is extremely difficult for a single compound to adequately characterise an entire settlement, however simple, in all its cultural complexity.

In layout and approach this work is very similar, though not as successful, to an earlier work by Labelle Prussin, **Architecture in Northern Ghana** (1969), considered by many to be a classic (Lawrence and Low 1990: 458). Prussin's work dealt with 6 independent communities in Northern Ghana but whereas Bourdier and Minh-ha dealt with domestic architectural space, its meaning and transformation, Prussin's work leaned more towards the relationship between ecological and social organisational factors and the built form.

The works of Paul Oliver over a period of almost two decades have made tremendous contribution to the study of non-pedigree architecture. One of his early works specifically dealt with African architecture, in its myriad forms and functions. **Shelter in Africa** (1971) is a collection of essays by architects, planners and other environmental experts on indigenous African architecture, including the seminal work of Schwertdfeger on houses in Zaria (1971) referred to above. More anthropological than architectural in outlook these works are expectedly extensive and wide-ranging and cover all aspects of the built environment. This was necessary in order to treat even a single continent let alone the whole globe. Oliver was one of the first to treat the subject sympathetically, some would say 'too sympathetically'. In his third work he alerted the world to the rapidly disappearing non-pedigree architectural forms, especially non-western types, and made a call for a new approach to the study of non-western architecture which is comprehensive, i.e.., inter-disciplinary, humane and exact (1976: 16 -24). Despite this his critics are quick to point out that some of these works are obsessed with the symbolic (Sa'ad 1981:78) and tend to be patronising (Prussin 1974: 182).

2.3 Statement of Purpose and Objective

From the foregoing it becomes obvious that Hausa domestic architecture has been largely side-stepped if not totally ignored, most especially by academics. As a result of this, an overwhelming majority of the Hausa built environment has been neglected or overlooked. The main purpose of this study therefore is an attempt to address this imbalance. It will focus intensively on the Hausa domestic architecture and attempt to establish its basic characteristics. This would be the major contribution of the thesis.

The objective of this study then is four fold;

a. To establish the basic characteristics of Hausa domestic architecture, i.e. its dominant spatial themes.

b. To show how the resulting domestic environment is supportive of the Hausa-Islamic culture.

c. To examine the cultural impact of colonialism on the concept of the dwelling unit and by extension, on the culture of the Hausa.

d. To broaden the data base of an indigenous knowledge system in the field of architecture.

2.4 Theoretical Stance And Aim

There are various theoretical propositions guiding the study of the built environment, that abstract concept dealing with human building activity.[17] However most of them fall under one of four major though overlapping, approaches; namely that, the nature and form of the built environment is the result of,

[17] For an excellent and extensive review of the theoretical approaches to the study of the built environment see Lawrence & Low (1990:453-505)

human
a. adaptation to the natural environment.

human
b. attempt to make and express meaning out of the environment.

human
c. conceptions of the self and the resultant behaviour .

human
d. social production and reproduction.

The theoretical stance of this study is that a strong relationship exists between the spatial organisation of domestic house and the social life of its inhabitants. Consequently changes in one result in changes in the other and vice-versa. The principal hypothesis that the thesis sets to develop and test is that Kano houses, as an example of Hausa urban domestic architecture, will share common socio-cultural spatial traits deriving from the courtyard house tradition. At the same time, it is possible that ethnic and occupational characteristics demand different functional requirements and or solutions. To the extent that this is the case, different ethnic and or occupational groups may well adapt an archetype, termed the Kano archetype, in order to accommodate specific work functions and or ethnic idiosyncrasies. Hence the extent to which the houses embody a common cultural heritage and the significance of ethnic differences will be explored. Thus the aim of this work is to analyse the relationship between the social life and the spatial configuration of the Hausa domestic house in an attempt to obtain a better understanding of the theoretical basis of this relationship.

A secondary hypothesis that the thesis sets out to test is that the changes in the political, economic and social fabric of the Hausa society as a result of colonialism, have had very little effect on most of the dominant aspects of the Hausa dominant material culture; to wit their architecture[18]. This is especially so within the walled city or *birni* because of the persistence of strong cultural ideas and ideals (Rapoport 1969 :79-80).

The questions that will be asked are:

a. What spatial morphological patterns define the Hausa house ? Are these patterns monocultural or are there sub-cultural variations ?

b. What is the relationship between spatial patterns and quotidian space use ? Is this relationship gender specific or not ?

c. What socio-cultural factors could account for the persistence and resilience of the Hausa spatial patterns?

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[18] Also their music, and their sartorial and culinary traits. But this is not the domain of this thesis.

2.5 Anticipated Results

There are several benefits highly likely to result from this study. First and foremost, the ordinary Hausa domestic house will be the subject of an intensive rather than extensive study. Focus will be for the first time on the house as a primary social domain in its multi-varied facets; how it is defined, how it is lived and how much is invested in the house socially and physically.

Secondly, the unravelling of how the Hausa ordinary houses are spatially articulated, likely to follow from this study, will lead to a better understanding of the production and transmission of Hausa culture. As demonstrated elsewhere (Glassie 1975), certain aspects of culture are best transmitted through social artefacts, the house being the cultural artefact par excellence.

Thirdly, although the study by itself may not lead to an improvement in the design of houses for the Hausa, it is hoped that it will lead to a fuller appreciation of the common domestic house as a means of social mapping, such that others may be lead to further study the Hausa house intensively. Only then would Hausa domestic architecture get the attention it deserves.

CHAPTER THREE : THE SETTING

3.1 Kano and Kasar Hausa

Kasar Hausa (Hausaland) covers a considerable part of northern Nigeria and southern Republic du Niger (**Figure 3.1**) and the *Hausawa* (the speakers of the Hausa language), are arguably the most important cultural group in Africa south of the Sahara and certainly the most populous[19]. There are various views as to who exactly is a *Bahaushe* or Hausaman. While some take the Hausa to be an ethnic group (Temple 1968; Cohen 1969), others take them to be a linguistic group (Palmer 1928; Abraham 1958). Yet others take them to be both; i.e. the term Hausa signifies both a language and a culture (Barkow 1973; Adamu 1978). A recent work (Miles 1994:48-59) emphasised culture in terms of religious identity over language.

Early Hausa social and political organisation was centred mainly around the *birni* (walled town or city) which usually contains a self-sufficient community united by trade and industry (Smith 1976). By the end of the first millennium seven such cities have become well established and strong enough to be the foci of all subsequent Hausa development. One of these cities is the city of Kano considered by some to be the military and economic nerve centre of Hausaland (Mahadi 1989).[20]

Kano City, located 8.4E and 12.1N (**Figure 3.2**), is the capital of an emirate, now designated a state (bearing the same name) situated in northern Nigeria. In terms of area it is the largest inland city in Africa that is not the capital of a nation. It is certainly the third most populous city of Nigeria[21]. It has the highest population density (7000 persons per sq. km.) in Africa south of the Sahara.[22] Its industrial base, mainly in manufacturing, processing and general services is vibrant and one of the most varied and extensive in the continent (Frishman 1994).[23]

Kano has a characteristic climate of hot-dry regions. The Hausa recognise a cycle of 4

seasons; two major seasons with two minor ones in between. The *kaka* which begins October and ends December is the harvest season and is considered a major season.

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[19]In Nigeria alone an estimated 45 million speak the Hausa as a first or second language. In addition to this there are a substantial number of Hausa speakers in other parts of West Africa, notably Republic du Niger, Chad, Cameroon and Northern Ghana (Adamu 1978).There are also a significant number of Hausa communities in Senegal, Libya, Sudan and Central African Republic.

[20] Others were Birom, Daura, Gobir, Katsina, Rano and Zaria.

[21]. Nigeria's population is officially 88.5 million. See the Nigerian National Population Commission report Census News Sept. 1992. Vol.3 No. 1. However many put forward the figure of at least 100 million. See World Bank report, World Development Report 1993.

[22]See Trevallion (1966 :10)

[23] Frishman has estimated that of the over 450 industries established in Kano from the end of colonial times in 1960 to 1990 more than 50% were still existing in 1993 despite the economic reorientation of 1987-1990 thus attesting to the resilience of its economy. Yet despite all these credentials Kano, as Frishman (1994) laments," has been hidden, ignored and generally overlooked," in the context of African economy.

Temperatures are generally mild and range from 25C to 30 C with very little or no precipitation. The *rani* considered a minor season, begins January and lasts until ends mid- March with no precipitation. This first part of the season is also known as *hunturu* among the Hausa, the period when dust laden wind, the harmattan, blows from the north-east causing spells of cold weather with temperatures dropping as low as 16C . These two are collectively termed the dry season by geographers.

The wet season consists of the minor *bazara* and the major *damina* . The *bazara* begins in March and lasts until the mid-May. This is the hottest season with little or no precipitation and temperatures as high as 55C . The *damina* is between mid-May and August with 90 % of the 900 mm total annual rains falling in this season. The month of August is characterised by the heaviest rainfalls usually with thunderstorms , a period called *marka* by the Hausa. It is the wettest and the most humid of all (**Figure 3.3**).

The Kano urban area is in what is geographically termed the Sudan savannah vegetation. It consists of sparsely placed small to medium trees in open fields with mimosa grasses that grow up to 2m high. Kano has one of the most fertile soils in Africa with a relatively high water table, containing enough moisture to maintain grass even in its driest season (Moretimore 1969). This coupled with the fact that the area is free from tsetse fly, the scourge of cattle and horses, makes the land suitable for intensive agriculture and animal husbandry.

Nothing definite can be said about its origin[24] but its generally accepted that at the turn of this millennium Kano was a vibrant settlement that grew into a powerful city state by the mid 14th. century (Smith 1971; Adamu 1978; Last 1979 ; Mahadi 1989). What was to become the modern Kano urban area was at one time a cluster of six settlements[25] each associated with one of the granitic inselbergs that dot the Kano landscape (Last 1979:9). The focal point of these settlements was Dala hill perhaps due to its proximity to River Jakara. The indigenous people were mainly hunters although it is established that their occupational specialisation included iron smelting and smithing.

The coming of Islam and its adoption as the religion of the state had important and lasting impacts on the socio- cultural disposition of Hausaland in general. Aside from the obvious change in spiritual outlook, Islam contributed immensely in the field of education, literary and intellectual development, administration, civil and criminal law and international trade and external relations of the Kano milieu. It is usually taken that Islam reached Hausaland in the 14th. century as a result of the huge influx of the Wangara refugees from the fall of the Songhai

[24]Controversy still rages between those who attribute the origin and development of early central Sudanic states to 'external' factors(Palmer 1928) ; 'internal' factors (Smith 1970) 'intrinsic' factors (Usman 1979) and those who propose an 'amalgam' theory (Sutton 1979 ; Last 1988).

[25] These were Dala, Gwauron Dutse, Magwan, Fanisau, Jigirya and Tanagar.

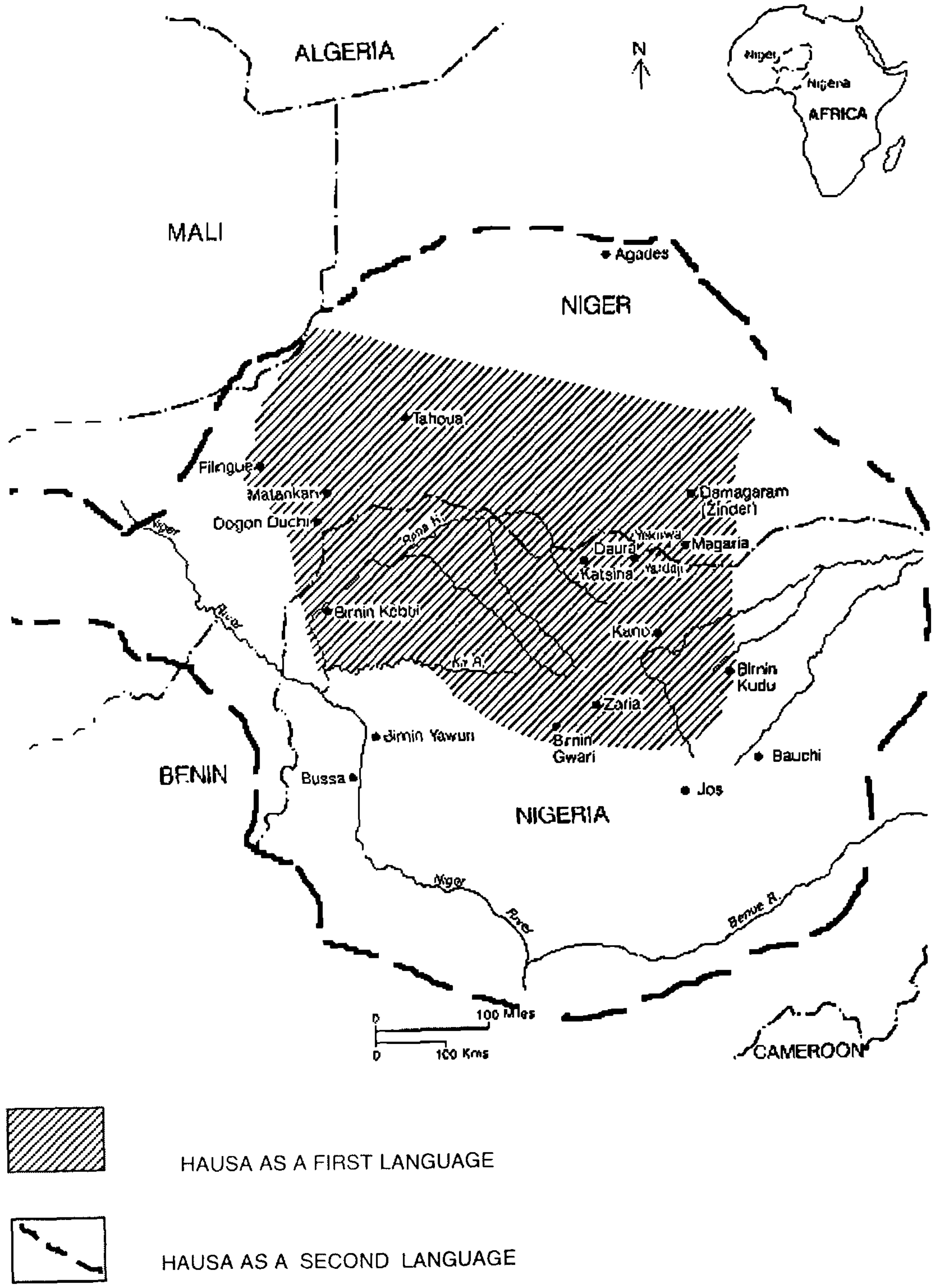

FIGURE 3.1 KASAR HAUSA { HAUSALAND}

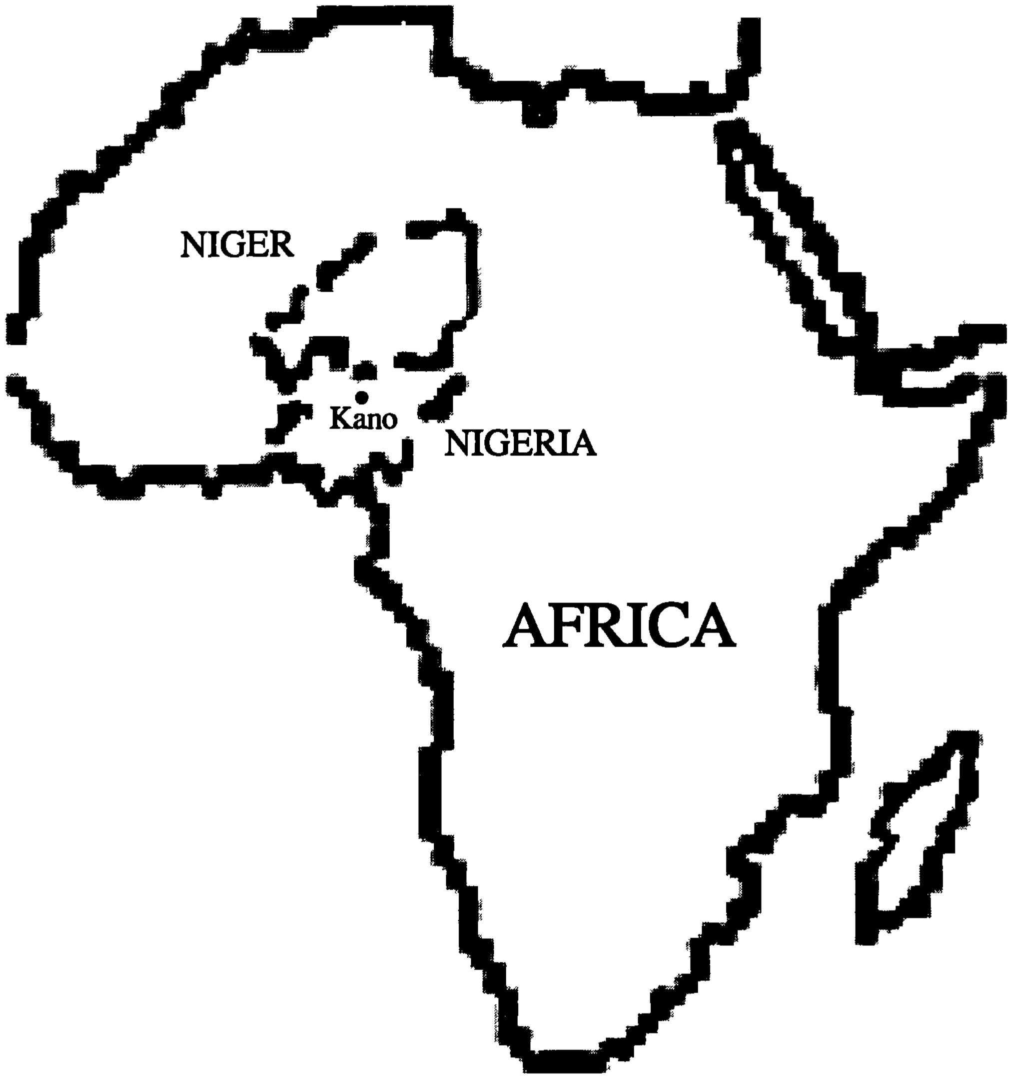

FIGURE 3.2 : KANO CITY LOCATION

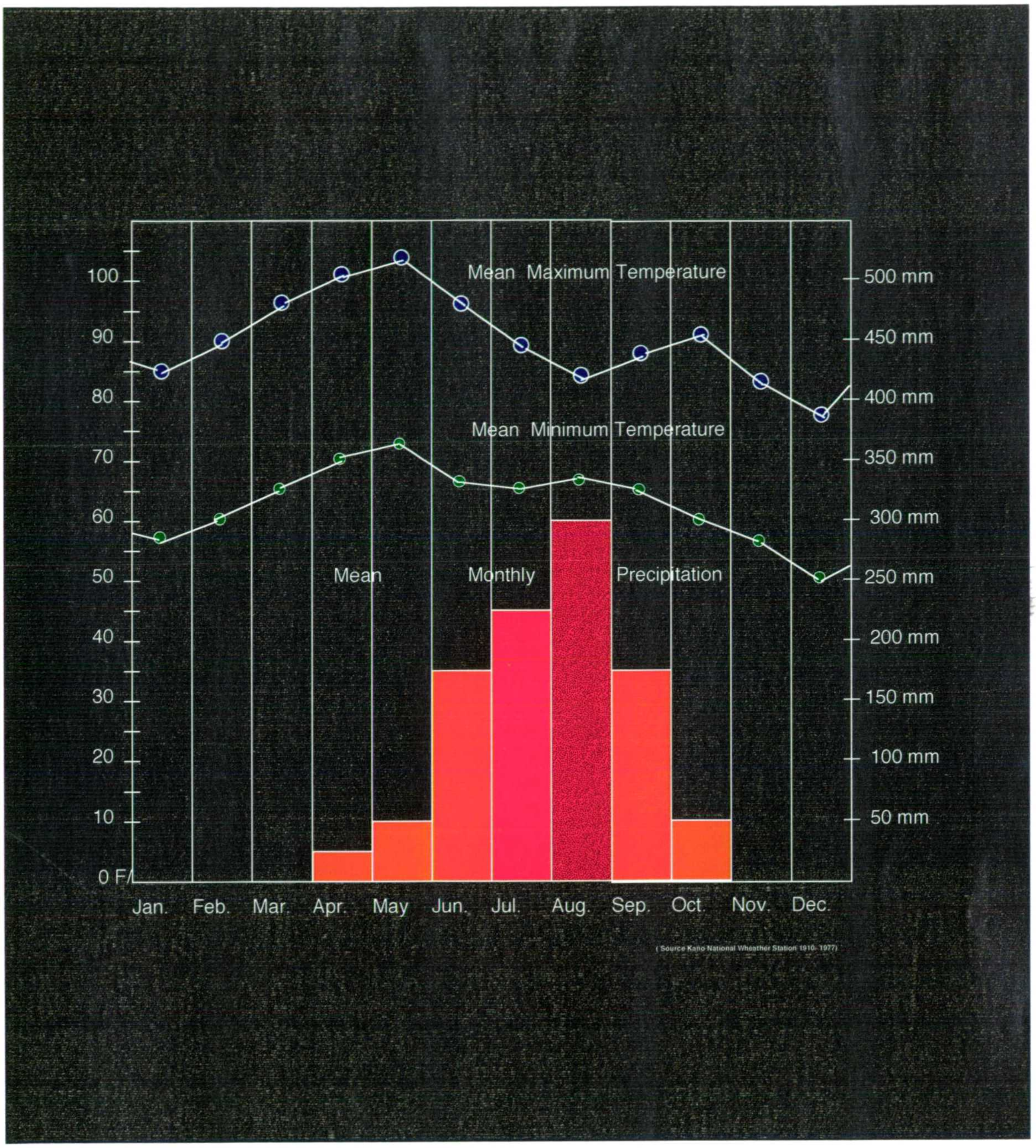

FIGURE 3.3 :KANO ANNUAL CLIMATIC DATA

Empire to the west (Palmer 1928; Greenberg 1946; Hallam 1966). Certainly this was the time when it was accepted as a state religion by Sarki Tsamiya (1307 -1343). However it is acknowledged that there had been waves of immigrants as well as traders from the north as early as the mid-10th. century some of whom no doubt would be proselytising Muslims[26].

By the end of the 12th. century the political institutions of the state, the *sarauta* system[27] a kind of monarchy in which succession is patrilineal (Usman 1974; Mahadi 1982), had assumed a firm and elaborate shape. The highest political authority was the *Sarki* or king , who resided in the state capital and had full executive, legislative and judicial powers. He was assisted by several councillors and advisors, the most important, in Kano for example, being the nine member king maker group or *Tara-ta-Kano*,[28] each with a portfolio . The office of the councillor was not restricted to the royal lineage; people with no royal blood including trusted slaves could, and did get appointed to an office.

For administrative purposes the state was divided into districts of unequal sizes and every important councillor is designated a *hakimi* or district head . Districts are made up of numerous villages and hamlets each under a *dagaci* or village administrator. The villages are in turn made up of several *unguwoyi* or wards (sing. *unguwa* or ward) headed by a *maiunguwa* or ward head who is usually the clan head or a distinguished person in the community. These ward heads were the key personnel in the Hausa political hierarchy because in the words of a contemporary councillor, " they know every single individual in the locality and have detailed knowledge of their movements. They know the location of all the farms and grazing grounds and to whom they belong; they have detailed knowledge of how many wives a particular man has, how many children and their various ages. The ward head even knows how many heads of cattle or how many donkeys a particular person possessed!" (Sarkin-Sudan 1978). The *Maiunguwa* is responsible to the *Dagaci* and the *dagaci* to the *Hakimi* who is answerable to the Sarki (Mahadi 1982; Ibrahim 1988).

The growth and development of Kano could be attributed to four main factors; its ability to produce surplus food as a result of its very fertile soil (Mahadi 1982); the manufacturing and trade acuity of the Hausa (Adamu 1978); the strategic position of the city state which made it

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[26] Horton (1975:374) has suggested that because these traders were more concerned with their business rather than proselytisation, the Islam they imported was not 'militant'. Perhaps this was the reason for the late dating of the coming of Islam in West Africa generally, and particularly in Hausaland.

[27] This has been erroneously termed feudal by some scholars. However most of the Hausa city states operated an economy based on an advanced mode of agricultural production capable of sufficient food surpluses to support large non-agricultural populations. Also although land was the prerogative of the Sarki, in reality it was invested in the community, since land wasn't exchanged for money nor was anyone tied to any land. See Frishman 1977 for a discussion on land tenure in Kano. See also Sjoberg (1960) on characteristics of feudalism in pre-industrial societies. Hill (1977:7-10) has admirably debunked the use of the term for the Kano socio-economic milieu. For a criticism of using this term to non-western non-European societies see Goody (1971).

[28] These were in order of seniority, the ***Galadima, Madaki, Wambai, Makama, Sarkin-Dawaki-Mai-Tuta., Sarkin-Bai, Barde Kerarriya, Sarkin-Dawakin-Tsakar-Gida,*** and ***Turaki.*** Sarki Muhammadu Kisoki (1509 -1565) replaced the ***Barde Kerarriya*** with the ***Dan Iya*** and Sarki Alwali (1781 -1807) replaced the ***Turaki*** with the ***Ciroma.*** See Fika (1978:9 & n40)

possible to exploit both regional and international trade (Mahadi op.cit..) and the emergence of the sarauta, a strong centralised political system, that made it possible for its economy to be integrated regionally (Ubah 1973; Usman 1978; Adamu 1979 ; Mahadi 1989). Thus by the end of the 14th. century Kano was a major urban and commercial centre renowned near and far.

The Usman 'Dan Hodio Jihad which established a Caliphate and brought the Fulani to power in the early 19th. century enhanced rather than detracted the pre-eminence of Kano in Hausaland (Hallam 1966). To all intents and purposes Kano was indeed 'the military and economic nerve centre of the Sokoto Caliphate' because it became,".....by far the single most populous Emirate in the Caliphate.......the richest and most flourishing....and....enjoyed a greater degree of stability than most of the major Emirates (Mahadi 1989:195). Kano maintained this position until the beginning of this century when it was conquered and colonised, becoming a subject of British imperial power. The British adopted a colonial policy of Indirect Rule where the Hausa administrative machinery was left more or less intact (Temple 1968:30).

Although prior to colonisation Kano's physical structure was that of a pre-industrial city, its economy however, was far from being pre-industrial for the chief economic institutions were manufacturing, entrepreneurship, capital formation, marketing, transportation and taxation (Adamu 1979:6). In addition its major economic preoccupations were agriculture, crafts and commerce (Frishman 1977:37). In fact Kano's agricultural potential and commercial activities were some of the major reasons for its colonisation. Thus it is not entirely correct to regard it as a typical pre-industrial city as believed by some scholars (Sjoberg 1960:56).

Slavery was practised and indeed played a pivotal role in the economic development of pre-colonial Kano (Pritchett 1990). However we would do well to note that in Hausaland slavery was never practised in the sense of the images that it invokes today. More often than not the lot of a slave were closely tied to that of his or her master. Barth travelling through Hausaland in the mid 19th. century observed that, "....domestic slavery has very little to offend the mind....;the slave is generally well treated, is not over-worked, and is very often considered as a member of the family." [29] Thus Smith (1959: 242) was able to conclude, " For this reason there were no slave rebellions in Hausa society throughout the last century....(and) ...*slaves were often freer than the free* " (emphasis not in the original). Slavery , as one scholar put it, was more like forced migration and resettlement (Frishman 1977).

As a result of colonisation Kano witnessed tremendous changes in its socio-cultural fabric: First, its political system, that of *Sarauta* , was replaced by indirect rule as a result of the formal abolition of the Sokoto Caliphate. By this single act the Hausa city state *sarki*, i.e. the king now termed Emir, became dependent on the whiteman for the legitimacy to rule. The Emir became

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[29] Barth however had observed that the Arabs residing in Hausaland did not treat their slaves in the same manner (ibid).

more and more concerned with pleasing the whiteman. Consequently he was by and large alienated from, and desensitised to the aspirations and desires of the general populace (Muhammad~Oumar 1990).

Secondly, its economy became radically altered in two main ways; its agrarian non-mechanised small scale manufacturing base was replaced by a fully-fledged market economy. Between 1914 and 1940 it was drawn into and was made part of the world capitalist system (Shenton 1981). Consequently a new currency system was established and cash crop production superseded its staple food crop production[30]; In addition slavery, an institution that sustained its economy (Pritchett 1990:32-47), making Kano the leading commercial centre in the Western Sudan, was abolished. This marginalised Kano to the periphery in international trade (Yahya 1989:19).

Thirdly many social ties and institutions were weakened or even radically altered by

a) the replacement of the Shari'a with common English law especially its criminal and civil aspects and the restriction of the Emir's judicial powers (Whittaker 1970).

b) the introduction of direct taxation and the insistence of the colonial government on collecting taxes in cash rather than in kind as was the case in pre-colonial times (Shenton 1981).

These changes not unexpectedly had profound effects on the social fabric of the city and its environs (Hill 1977), of which not the least is the city's tremendous spatial (Frishman 1977) and demographic (Mabogunje 1968) expansion.

3.2 Kano[31] Urban Characteristics

The modern Kano urban territory covers an area of about 170 Km^2. Approximately 15% of this (about 2500 hectares) forms the gross residential area of metropolitan Kano which accommodates a population of over two million in 1990. Physically it is composed of 3 main areas, namely the *Birni* or walled city; *Waje* and the Township (**Figure 3.4**)[32].

Waje area includes several suburbs to the north and north-east of the Walled City[33]. The oldest is the suburb of *Fagge* established in the 12th. century, as a camping ground for Northern traders. Originally it was inhabited by people from other parts of Hausaland especially to the north. Today it is still inhabited mainly by Hausa people including many who migrated from the

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[30]This is not to say that the Hausa economy is unconnected with cash crops; almost every nuclear family grow cash crops, however the distinction between cash and food crops wasn't exact until colonial times.

[31] The epithet of Kano is ***Garin Da Ba Kano Ba , Dajin Allah***; meaning, a city other than Kano is but mere jungle. This is said proudly and sometimes nostalgically by *Kanawa* or the Kano indigines.

[32]This was the pre 1992 administrative divisions. In the 1992 Local Government Area reforms the Walled City was shared between Dala and Municipal Local Governments. See **Figure 3.5**

[33]Actually to the Kano inhabitants everywhere other than the old walled city is considered *waje* or suburb.

Walled City. There is the suburb of *Sabon Gari* which was established in 1914 to cater for the people from the southern parts of the country who came with the arrival of the railway (Frishman 1977:98). It is still inhabited mainly by non-Hausa people and hence from a different cultural background. Other suburbs include *Tudun Wada* and *Gwagwarwa* [34] and their recent squatter extensions of *Tudun Murtala* and *Dakata* (Main 1990). Although these have a mixture of various ethnic groups the *Hausa* are still the pre-dominant inhabitants. Finally there are the surrounding villages of *Kurna* and *Rijiya* to the north of the walled city, that in recent years have grown as residential areas and have merged into what is now known as the Greater Kano Urban Area.

The Township area consists of the suburbs of *Bompai* and *Nassarawa*, to the east of the walled city, that constituted the former colonial seat of government. Included also in this area are the former villages of *Gyaɗi -gyaɗi, Tarauni, Hotoro and Nai'bawa* to the south-east, that over the years have been engulfed by urban Kano. In addition there are also the new residential areas of *Hausawa, Sheka*, and *Sharaɗa* to the south-west of the walled city .

The *Birni* or the Walled City dates back to the establishment of the first *Haɓe* Dynasty circa 1000 CE . Kano was first walled during the reign of King Gijimasu (1095 - 1134) to encompass earliest settlements around the twin hills of *Dala* and *Gwauran Dutse* and in the thick jungle along *River Jakara.* (*Waƙar Bagauda* vv 36-43; Palmer 1928 :99-100). The walls were gradually extended to encompass more land as the population and importance of Kano grew (Moody 1967, Barkindo 1983). **(Figure 3.6).**

Currently the walled city is composed of 138[35] social units called wards (**Figure 3.7**) . If the example of what obtains currently in the villages is anything to go by, then most wards probably started as a clan or family area from a single homestead or compound that grew organically. Such clans and families usually belong to a tribe or ethnic group and usually have a common trade or practice a particular craft.

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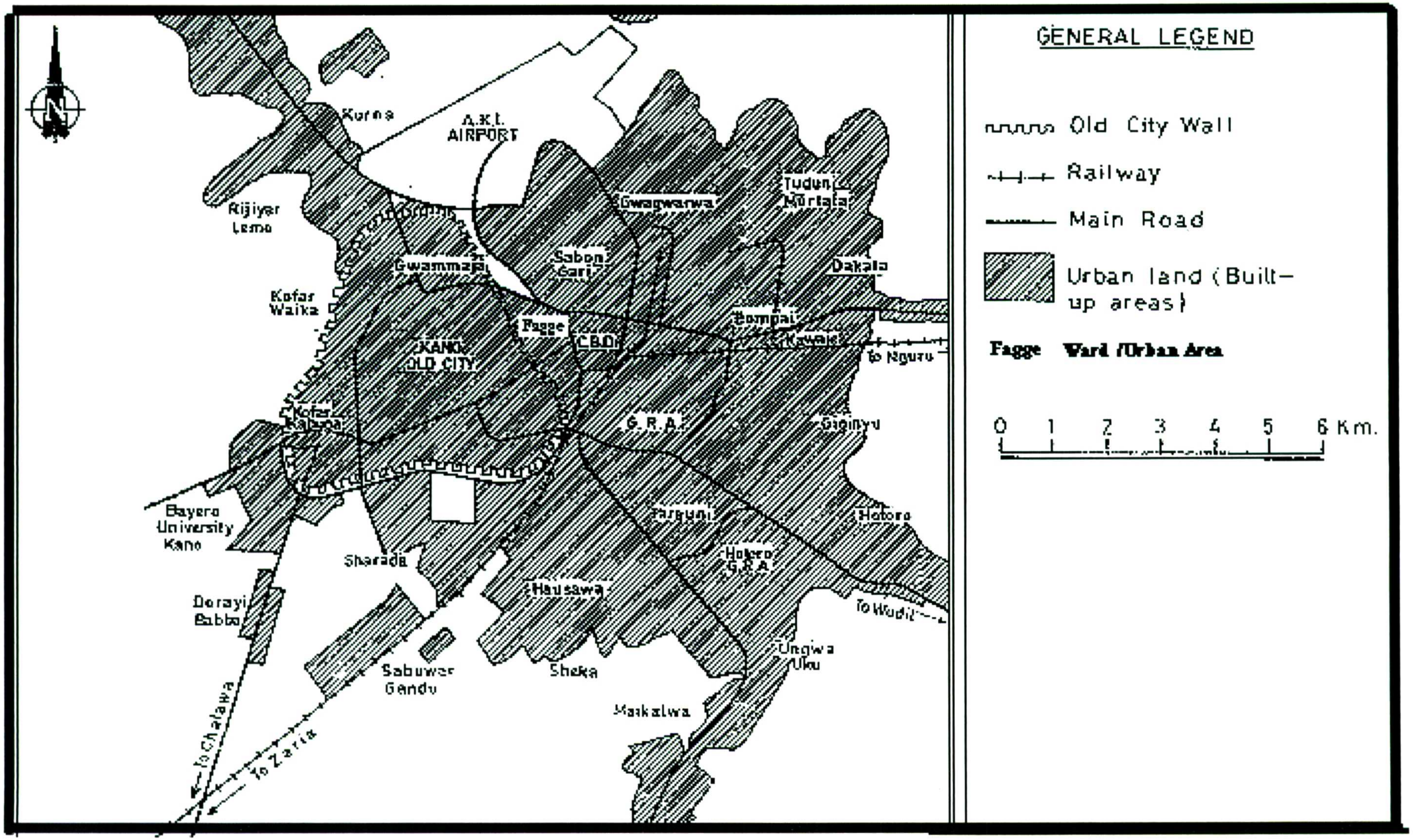
[34]Basically the difference between the oldest Kano suburb of Fagge and Tudunwada in terms of type of inhabitants lies in trade or profession ; most of the inhabitants of the suburb of Tudunwada work in the industries close by(See Lubeck 1972). Gwagwarwa on the other hand is a mixture of various ethnic groups.

[35] 126 wards is the figure given by Paden as recorded by him in 1965 (1973:14). Since then new wards like *Sani Mai Nagge* have come to be. Frishman (1977:401) has 131 as follows; N 31, E 38, S 29 & W 33. A more recent work puts the total at 132 as follows; N29; E 38; S 26 & W 39 (Liman 1990). I am grateful to Mallam Liman for this information. But according to Yahya (1992 : 54) the total number in July 1989 was 137 as follows; N 30 ,E 39, S 29, W39 although he did not list them. Loimbier (1993) had a figure of 135 as follows N 30 ,E 39, S 25, W 41. From the official lists given to me by the respective sector *Wakilai*, the administrative heads in July 1994, the wards add up to 138 wards as follows;N 33 ,E 38, S 27, W 40 (**Appendix 6**) . See also **Figure 3.7**



(After Main 1988; Liman 1991 & Fieldwork)

FIGURE 3.4 : KANO URBAN AREAS 1994

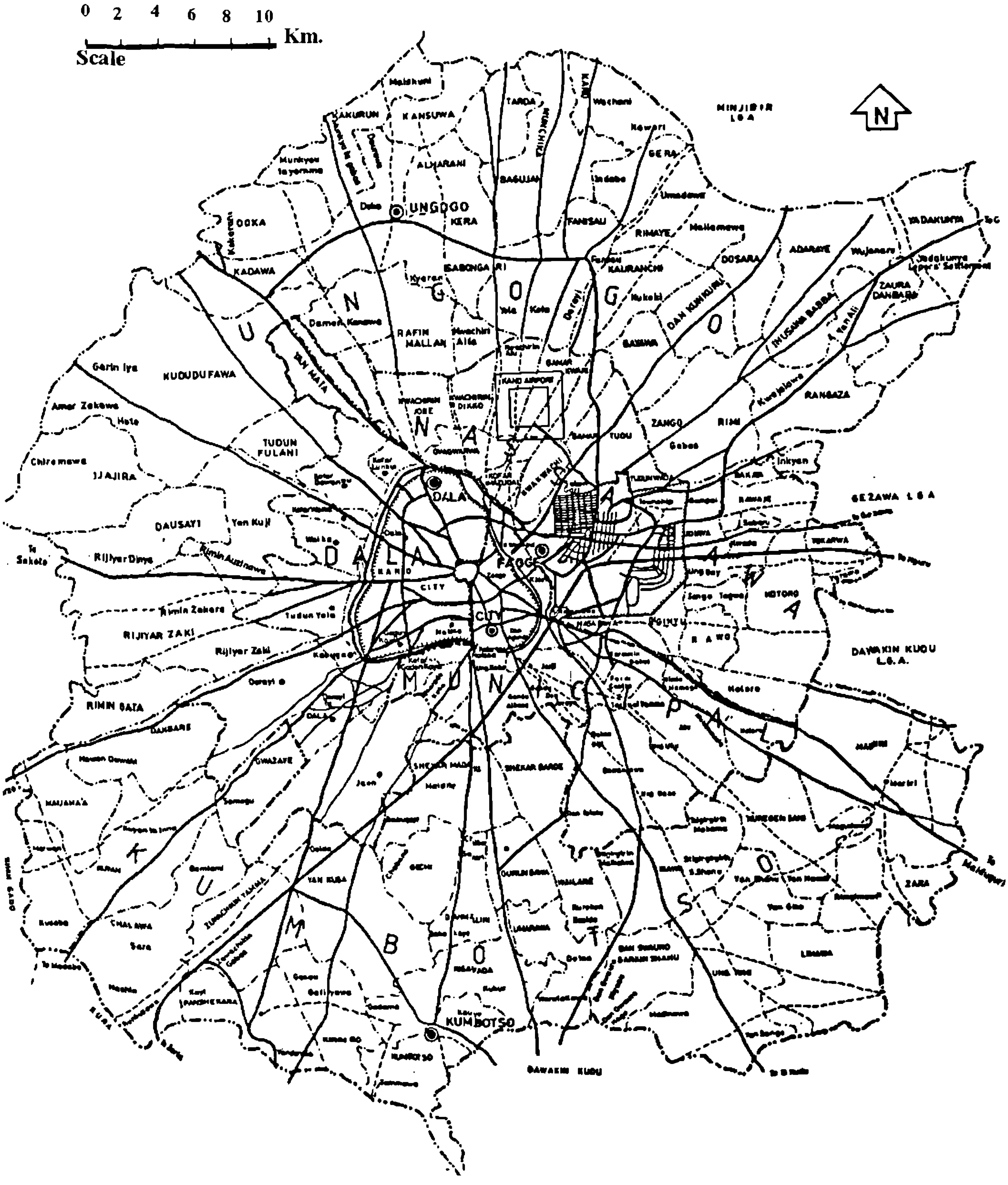
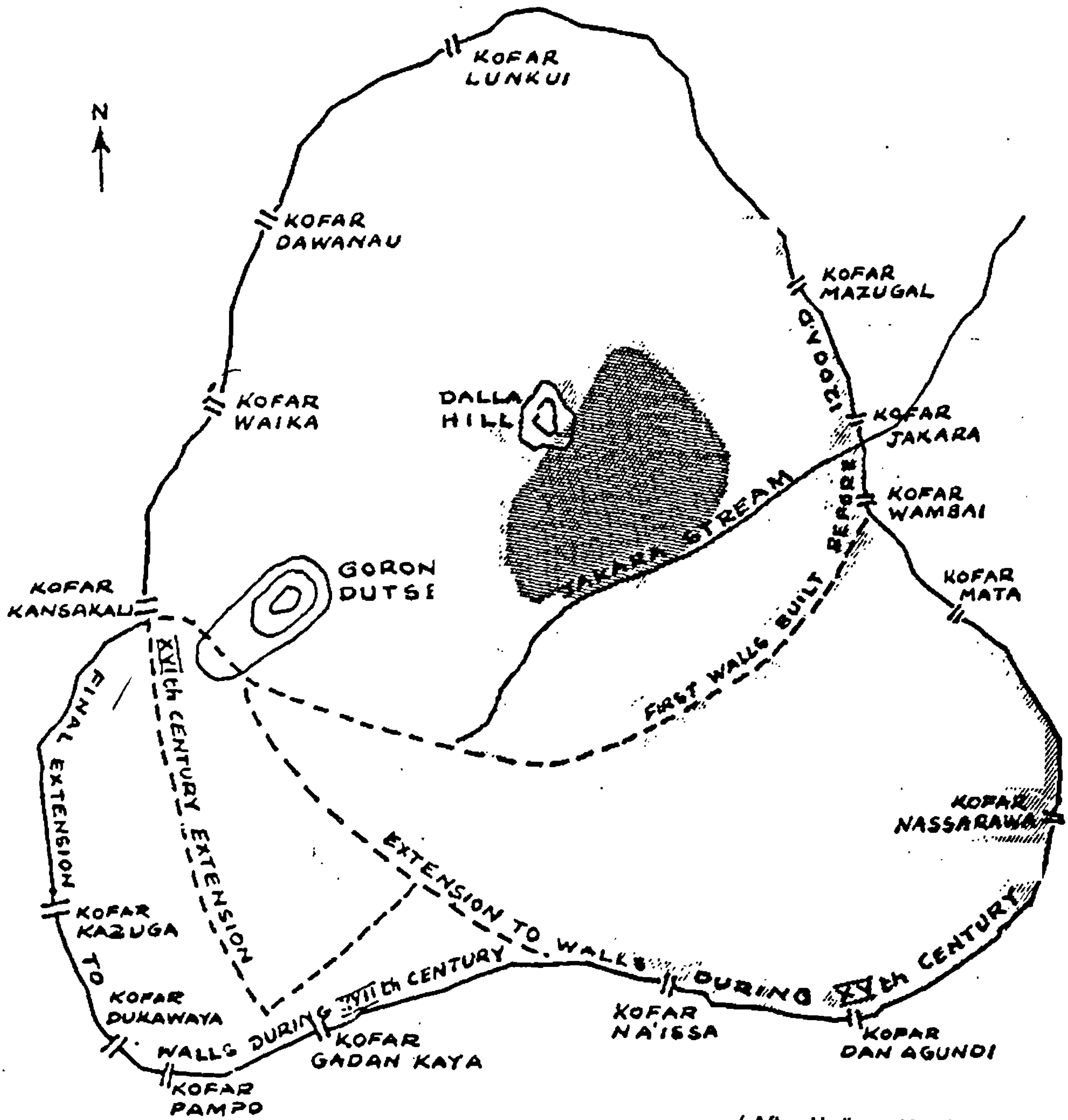


FIGURE 3.5 : KANO LOCAL GOVERNMENT AREAS 1994



(After Hallam 1964)

FIGURE 3.6 : KANO CITY WALL GROWTH

Due to the still strong social ties (Frishman 1977: 392), the residential pattern within wards generally shows an absence of class differentiation[36] and houses belonging to people with different wealth or incomes exist side by side. This is true of the past as it is of today. Thus despite the large-scale acquisition of more open and palatial residences in the suburbs by the educated elites, it is not uncommon to find rich men living next to poor men. Equally true now, is the fact that the size of a house, more often than not is an indication of filial ties rather than wealth. In pre-colonial times and until the economic boom of the late 1960's and early 1970's, there used to be little or no differentiation between residential place and work place. Then it was, "possible to determine the ethnic identification of an occupational category by....(its) ....location.....in the city" (Paden 1973:23). Wards vary in the ethnic origin and trade or crafts orientation of its first and subsequent settlers. Yet although some ethnic group might form the majority of the residents no ward is, or has ever been, exclusive to any group ethnic or otherwise. Still wards differ in size and do not have clearly defined boundaries but merge one into another.

However most of the residents including children over the age of 10, and females who come to reside in the ward as a result of marriage, are acutely aware of, and could easily indicate the limits of their wards, thus attesting to the persistence of a strong sense of belonging. In the past it was typical for a ward to have as its inner core a communal open space called *dandali*. Depending on the size of the ward this may contain a ward mosque, a large tree usually a *durumi* (*Ficus Thoningii* or fig tree) under which a traditional Qur'anic school holds, and sometimes a petty market. However in many of the wards surveyed this communal space has been transformed in function; altered in size; relocated to the periphery or simply encroached and built upon.

From the *dandali* several narrow streets (or *hanyoyi* sing; *hanya or rariya*) radiate out not unlike the lattice of a leaf .[37] Many of these streets end up in a *lungu*, or cul-de-sac at the end of which is found a *fangali* or a small open space that has the doors of several houses opening onto it. Most *hanyoyi* join others from adjacent wards, thus linking the wards together. The width of a *hanya* varies from narrow enough for two people to pass each other side ways to wide enough for two horsemen to pass each other abreast. This coupled with the fact that the walls of compounds are usually high (average 3m) makes movement along *hanya* or *rariya* spatially and visually full of surprises, especially in the early afternoon when the high walls cast shadows onto each other . Inside the wards paths are, " never straight, plots never regular, blocks never rectangular, existing walls never regular" (Sa'ad, 1981:46).

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[36]Scholars are not agreed on the nature and type of the Hausa system of class. Those with Marxist- socialist background insist that Hausa society has a class structure but disagree on what form this structure takes. While some accept that it is more like honour-status system (Lubeck 1975:17) others insist its a full-pledged class system (Shenton 1981). None of these however captures the essence of the Hausa social structure. For a discussion on this problem see Smith (1959; 239-251).

[37]Not all *unguwoyi* have their *dandali* centrally located. An *unguwa* could have its *dandali* located anywhere within its bounds. Also in some cases one finds a large *dandali* created by the junction of two or more wards.

(Source: Paden 1973 ; Liman 1990 & Fieldwork 1994)

UNGUWOWIN KANO 1994

1. Adakawa (N)
2. Agadasawa (E)
3. Aikawa (N)
4. Akwa (W)
5. Alfindiki (S)
6. Alkantara (E)
7. Arzai (N)
8. Ayagi (W)
9. Bakin Ruwa(W)
10. Bakin Zuwo (E)
11. Cedi (E)
12. Cediya (N)
13. Cediyar Fero (E)
14. Cediyar Kuda (E)
15. Ciranci (W)
16. Ciromawa (E)
17. Daganda (E)
18. Dala (N)
19. Dambazau(E)
20. Dandago (W)
21. Dandali (N)
22. Daneji (S)
23. Darma (E)
24. Daurawa (N)
25. Dausayi (W)
26. Diso (W)
27. Dogarai (S)
28. Dogon Nama (W)
29. Dorayi (S)
30. Dukawa (E)
31. Dukurawa (N)
32. Durumin Arbabi(E)
33. Durumin Daje (N)
34. Durumin Iya (S)
35. Durumin Zungura (S)
36. Gabari (E)
37. Galadanci (W)
38. Gangamau (N)
39. Garangamawa (W)
40. Garke (N)
41. Gidan Sarki(S)
42. Gwale (W)
43. Gwammaja A (N)
44. Gwammaja B (N)
45. Gwangwazo (S)
46. Gwauran Dutse (W)
47. Gyaranya(W)
48. Hausawa (W)
49. Indabawa (S)
50. Jingau (W)
51. Jujin 'Yan Labo(E)
52. Juma (N)
53. Kabara (S)
54. Kabawa(N)
55. Kabuga (W)
56. Kabuwaya (N)
57. Kaigama (W)
58. Kangiwa(N)
59. Kankarofi (S)
60. Kantudu (N)
61. Kofar Dukawiya (W)
62. Kofar Gadankaya (W)
63. Kofar Kabuga (W)
64. Kofar Kansakali (W)
65. Kofar Mata (S)
66. Kofar Mazugal(N)
67. Kofar Nassarawa (S)
68. Kofar Ruwa (N)
69. Kofar Waika (W)
70. Kofar Wambai (E)
71. Koki (E)
72. Kududdufawa (E)
73. Kurawa (S)
74. Kurmawa (S)
75. Kurna (E)
76. Kwalwa (E)
77. Kwarin Mabuga (E)
78. Lallokin Lemu (E)
79. Limanci (N)
80. Lokon Makera (W)
81. Madabo (N)
82. Madigawa (W)
83. Madungurun(W)
84. Magashi (W)
85. Magoga (W)
86. MaiAduwa (W)
87. Makafin Dala (N)
88. Makafin Kofar Wambai(E)
89. Makwalla (N)
90. Makwarari (E)
91. Mallam Ganari (E)
92. Mandawari(W)
93. Manladan(W)
94. Mararraba (W)
95. Marmara (S)
96. Masakar Kuda (N)
97. Masukwani (E)
98. Mazan Kwarai (E)
99. Mazugal (N)
100. Mazugal Kudu (N)
101. Rijiya Biyu (N)
102. Rijiya Hudu (W)
103. Rimin Kira (S)
104 Sabon Sara (W)
105. Sagagi(S)
106. Sani Mai Nagge A (W)
107. Sani Mai Nagge B (W)
108. Sanka (W)
109. Sarari (N)
110. Satatima (E)
111. Sharfadi (E)
112. Sharifai(E)
113. Shatsari (N)
114. Sheshe (S)
115. Shirawa (N)
116. Soron Dinki (S)
117. Sudawa (W)
118. Takalmawa (E)
119. Tudun Makera (N)
120. Tudun Nufawa (E)
121. Tudun Wada (E)
122. Tudun Wazirci(S)
123. Unguwar Gini(S)
124. Warure (W)
125. Wudilawa (S)
126. Yakasai (S)
127. Yakasai S.Unguwa(S)
128. Yalwa (W)
129. 'Yan Awaki (E)
130. 'Yan Doya (E)
131. 'Yan Muruci (E)
132. 'Yan Tandu(N)
133. 'Yar Kasuwa (W)
134. Yola(E)
135. Zage (S)
136. Zaitawa(E)
137. Zango (S)
138.. Zangon Bare-bari(E)

FIGURE 3.7 : KANO CITY WARDS

FIGURE 3.8 : KANO CITY URBAN STRUCTURE

The morphology of the city at large is not very much different. Wide lanes[38] radiate from the central market - the *Kurmi* market - and link the major parts of the city like the *Fada* or Emir's palace, the *Masallacin Jumu'a* or central mosque etc. (**Figure 3.8**). These trans-sector lanes called *gwadabe*, " have metamorphosed into vehicular roads," in modern times (Sa'ad, 1981:45).

The conversion of the *gwadabe* into motor able roads is the physical effect of the Indirect rule policy on the Walled City. This was perhaps, the biggest physical tampering[39] with the city that the colonial administration undertook in its almost 60 year rule of Kano. Subsequent post colonial changes in the urban fabric of the walled city have had no significant impact on the spatial morphology of the city. A detailed spatial analysis of the walled city over three generations is presented in **Appendix 1**.

The growth and development of the city in this century, not unexpectedly, has been mainly outside and away from the walled city, in an area established to the east of the walled city[40]. This new sector was based on western concepts and values of physical growth and social and development. Thus the old city was," essentially ignored ; its basic characteristics were fixed and reinforced " (Frishman 1977:115). Physically then , the walled city continued to operate and develop based upon indigenous socio-cultural factors. The result is that Kano became what is known as a dual city, with two distinct sectors based, in many instances, on radically different socio-cultural norms. However, although in both sectors land belonged to and was the prerogative of the government, land use pattern and distribution became gradually subservient to economic factors in the new sector while in the traditional city it remained more or less determined by the dominant socio-cultural factors, perhaps until the end of colonial rule. In Kano, therefore, we have a situation where the original settlement morphology is still discernible and the spatial structure at the global and local levels are consistent with a traditional way of life.

3.3 Kano Sectors : History And Growth

The 138 wards in the old city are currently organised into 4 sectors, but in pre-colonial times the city was loosely divided into ten[41] administrative sectors, each under a councillor, who reported

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[38]The width of a lane ranges from narrow enough to accommodate a single horseman as well as pedestrians to wide enough to accommodate three horsemen abreast.

[39]Of course there have been several drainage, piped water and electricity schemes from about 1920 until the end of colonial rule in 1960. See Fika (1978) for details.

[40]It used to be, and in many cases it still is the case in ' Third World' countries that when cities are to be expanded or extended, this is done away from the historic core of the city because of the latent assumption that being unplanned, or organic, the indigenous city is chaotic and hence dysfunctional. See Hanson (1989) for a refutation of such assumptions.

[41]These were in order of seniority ; *Madabo, Gwauron Duma, Sheshe, Darma, Cediya, Jingau, Zango, Makama, Shetima* and *Cigari*. This was enumerated to me in an interview, 12 July 1994, by Hajia Hauwa Feda of Cediya ward a direct descendant of the last Gwauron Duma title holder before colonialism. Alhaji Muhtari Ibrahim Cedi, *Wakilin Gabas* confirmed to me (18 July 1994) the first three and the last two as correct but declined to say anything definite about the others. Hajia Hauwa's information is supported by the Kano Chronicle which reported (Palmer 1928 : 113) that a certain *Dan Goron Duma* came to Kano during the reign of King Muhammadu Kisoki (1509 -1565). Also Fika (1972 : 34), reported that the post of *Shetima* was a slave post created only after the Kano Civil War of 1893-1895. See also Paden (1973: 19) and Liman (1990).

directly to the *Sarki.* Each sector was composed of several *unguwoyi* or wards [42] differentiated by clear social characteristics. Each ward was socially accounted for by a *MaiUnguwa* or ward head.

With the advent of colonialism at the turn of this century, the British colonial government in pursuit of its policy of indirect rule found it necessary to transform the hitherto mainly social office of the *MaiUnguwa* or ward head, into a minor Native Authority (NA) appointment for political reasons. The *MaiUnguwa* was charged primarily with the task of collecting and in some cases even assigning poll tax. For the same reason the city was then divided into administrative sectors, based on the four cardinal points namely, north, east, south and west. Each sector was placed under a district head who had a seat in the NA council. These administrative units have survived to this day. Below is a summary of the history and the basic social characteristics of each of the four sectors.

3.3.1 North Sector (Fuskar Arewa)

Fuskar Arewa, the North sector of the walled city of Kano (**Figure 3.9**), is generally acknowledged as the area in which the initial settlement, that formed the primordial nucleus of what was to become the city of Kano, was located. According to the Kano Chronicle (Palmer 1928:97) the politico-spiritual leader of these early settlers lived on Dala Hill, while their shrine was at *Kagua,* currently identified as part of the present day ***Madabo*** ward. In fact the area where this initial settlement was located was known as *Kaguar Dala* or the Dala stockade (Last 1979:7 ; Lavers 1980:21). Until the end of the 16th. century, the King's palace, the political centre of Kano, was located therein . So also was the first mosque and the residence of the *Babban Malami,* the head of the city's literati. Even today the North sector is in many ways the cultural centre of the city.

A substantial part of the north sector used to be in pre-colonial times under the defunct Madabo and Goron Duma zones, then considered the most important sections of the city. The administrative head of Goron Duma was the only councillor with a permanent seat in the King's council (Liman 1990), signifying the importance of the zone. Thus the area was among the first to be entirely enclosed by the first city wall of 12th. century (Moody 1967: 56 ; Barkindo 1983:15).

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[42] Paden (Paden 1973:19) contented that," In the nineteenth century, Kano City was not formally subdivided into wards, although there were sections of the town that consisted of particular ethnic, clan or occupational groups." This is not correct since those 'sections of the town that consisted of particular ethnic, clan or occupational groups' were identifiable by name and were known as wards very early in the history of the city. See Palmer (1928: 104 -107 & 119 -121) and Muffet (1964:57).

Figure 3.9 : Kano (Fuskar Arewa) North Sector

Both in area and in population it is the second largest sector, after Fuskar Yamma and Fuskar Gabas respectively (Frishman 1977: 206). A 1963 survey recorded a population density of 113 per acre for the north sector (Trevallion 1963: 49), the lowest in the walled city. Most of the inhabitants of this sector earn their livelihood by trading although there are many that are also artisans.

There are 33 wards in this sector, from which 7 were selected namely, **Adakawa, Ceďiya, Dala, Dandali, Dukurawa, Madabo and Tudun Maƙera (Appendix 2)**. From each a sample of 5 houses was taken making a total of 35 from this sector.

3. 3. 2 East Sector (Fuskar Gabas)

Fuskar Gabas or the East Sector of the city (**Figure 3.10**) is in many ways unique. It contains some of the oldest parts of the city and it is, more or less, the core of the city's

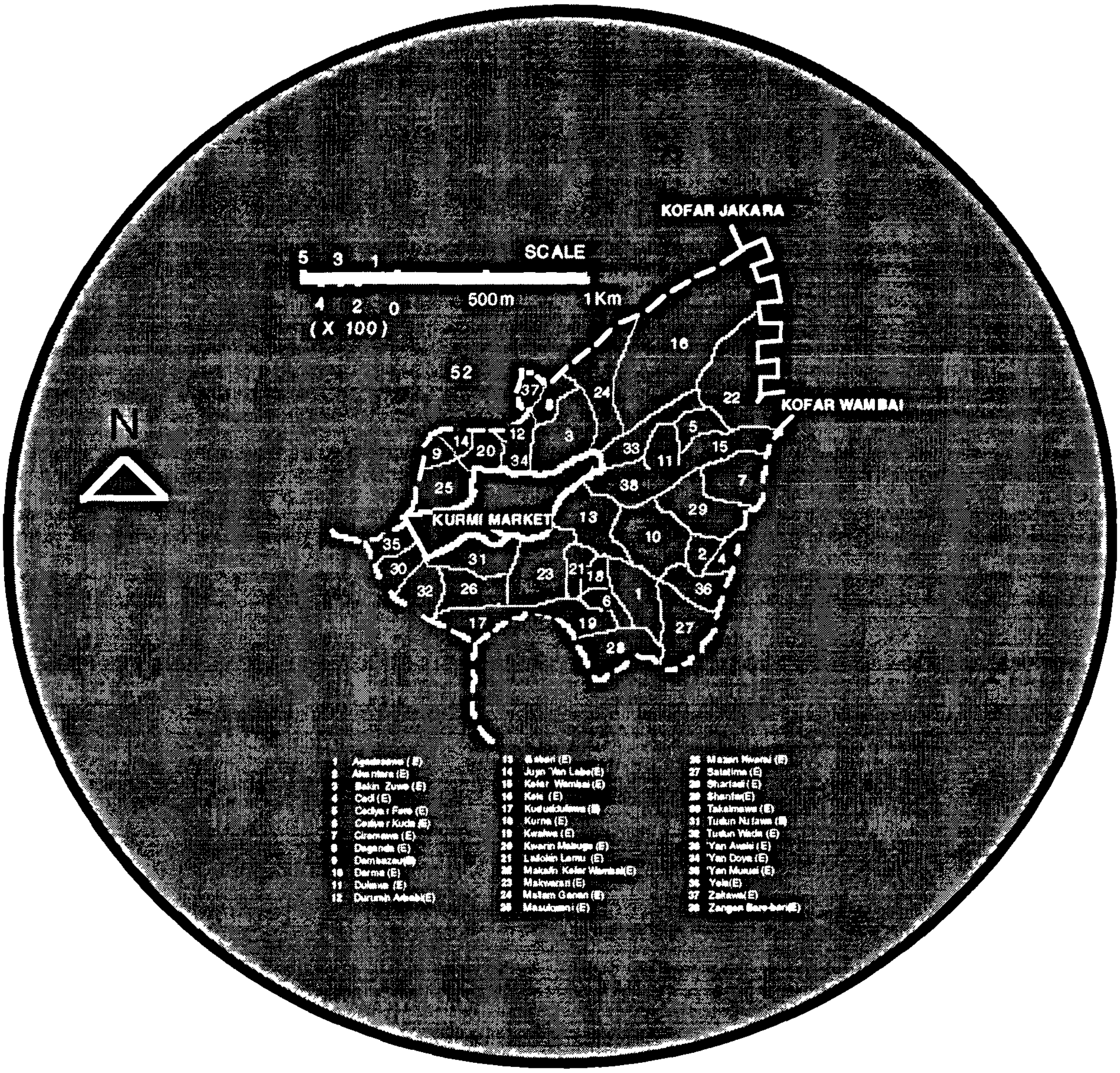

Figure 3.10 : Kano (Fuskar Gabas) East Sector

economic activity (Paden 1973: 20; Perchonock 1976 : 5), encompassing as it does the great Kurmi market . It is also the most populous and the least in area making it the sector with the highest density in the city (Trevallion 1963: 49; Frishman 1977: 218). Although like every sector of the city it has both wealthy and poor wards, it strikes one as the closest to what may be termed, a middle class sector in the city. The sector was carved out of 5 of the 10 administrative zones[43] at the beginning of this century (Paden 1973 : 19 ; Liman 1990). It should be noted that out of the 4 city sectors, it has undergone the least spatio-physical change as a result of colonialism.

From the early 1940's until the end of the Nigerian Civil war in 1970 it was the headquarters of the Sufi order, Tijjania and was always a bee-hive of activities. Currently the east sector has 38 wards from which 11 were selected. These are ***Bakin Zuwo; Danbazau ; Darma ; Durumin Arbabi ; Gabari ; Koƙi ; Kwarin Mabuga; Mallam Ganari ; Sharifai ; Tudun Nufawa and Zangon Bare- bari*** (**Appendix 2**). From each of these wards 5 houses were selected making a total number of 55 houses from this sector.

3. 3. 3 South Sector (Fuskar Kudu)

Fuskar Kudu or the south sector (**Figure 3.11**) , was established in the second half of the 15th. century. It is the smallest and the most recent part of the Old City (Palmer 1928; Moody 1967; Frishman 1977; Barkindo 1983). King Muhammad Rumfa came to the throne in 1463 and subsequently built a new palace to the south, and just outside of the then city wall .

The exact date is lost in antiquity but by the time he died in 1499 the city wall had been extended to incorporate not only the new palace but an extra 5.10 km^2 of land bringing the area of the city to a total of 14.5 km^2. This extension of the city wall as usual led to the establishment of new wards for instance ***Soron Ɗinki***, while some of the existing wards like ***Sheshe*** , were expanded. Yet others, for instance ***Yakasai*** were most probably relocated. This development was accelerated by the huge influx of various immigrants into Kano during the first half of the 15th. century (Palmer 1928). The re-location of the palace to this area made it the domain of the nobility ; princes, ministers, clerics, royal retainers and clients. Thus most of the highly influential pre-colonial officials for instance, the *Waziri* or chief minister, the *Chiroma* or heir apparent and the *Uwar Soro* or queen mother have their official residences located in the sector. In addition there are also several other lesser officials and royal clients[44]. As the political centre of the city it has invariably been associated with power, grandeur and splendour.

This sector has only 27 wards from which 6 wards were selected (See **Appendix 2**). These are ***Alfindiki, Soron Ɗinki, Sheshe, Unguwar Gini, Yakasai and Zango.*** The number of houses selected from this sector is 40 .

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[43]These were *Ceɗiya* , *Cigari* , *Darma* , *Gwauron Duma, Jingau* , *Madabo* , *Makama* , *Sheshe* , *Shettima* and *Zango.* See supra **Chapter 3** .

[44]Apart from the hundreds of servants and descendents of former slaves, still living within the four walls of the palace , there used to be thousands of royal retainers living in the immediate vicinity of the palace. A ward called *Dogarai* , used to be mainly populated by royal clients.

Figure 3.11 : Kano (Fuskar Kudu) South Sector

3.3.4 West Sector (Fuskar Yamma)

Fuskar Yamma, the West sector of the city is the largest sector in terms of surface area (**Figure 3.12**). It is the only sector whose current size is the cumulative effect of the four phases of Kano City wall development (Barkindo 1983). In other words the sector has increased in size with every extension of the city wall . Thus it has witinin it some of the oldest wards as well as some of the most recent wards [45]. Throughout the history of the city and even with recent developments it has been the most sparsely populated part of the city. This is because of the practice of *[illegible]* whereby a sizeable tract of agricultural land capable of maintaining the city in the event of a siege, is always left fallow (See **Appendix 1** for details) .

[45]**Bakin Ruwa** for example, is acknowledged as the home of *[illegible]*, the only existing aboriginal Kano people. Conversely Sani Mai Nagge B is the most recent of the Kano wards.

Of the 40 wards in this sector, six wards were selected, namely **Bakin Ruwa, Diso, Jingau, Lokon Makera, Sani Mai Nagge** and **Warure (Appendix 2)**. A total of 30 houses or 5 from each ward formed the sample from the sector.

Figure 3.12 : Kano (Fuskar Yamma) West Sector

3.4 The Typical Kano House

It is appropriate, and perhaps even necessary to describe a typical Hausa urban house at this juncture . A Hausa house called *gida* [46] (pl. *gidaje*), has three main parts [47], the *ƙofar gida* or the outer section, the *tsakar gida* or central courtyard and *ƙurya* or the inner section. **Figure 3.13** shows the sketch of an ideal Hausa house as conceived by a well known practising Hausa *magini* or master builder (Sa'ad 1981), which needless to say does not exisit. The house is

46 *The* The Hausa use the phrase *Gidanmu gidan daɗi* for 'Home sweet home'

47This classification is not universal. In some cases the *tsakar gida* and the *ƙurya* are grouped together and termed *cikin gida*(Sa'ad 1981:47-54; Moughtin 1985 ; 57-61) accessed through an entrance hall or *zaure*[48]. This is the most public part of the house. In Hausa society there is a strict sex segregation (see infra **§ 4.4**) and the *zaure* is invariably a male domain. There might be more than one *zaure* depending upon the size and or status of the family. It is also the most elaborate part of the house, its size and elaboration reflecting the status of the family (Sa'ad 1981: Moughtin 1985). However the deeper a *zaure* is from the outside, the more it becomes under female purview.

Some houses have an open space called *farfajiya* or *shamaki* preceding the zaure where may be found a *dakali* or raised seating. There might be a room leading off from the *zaure* called *shago* that is used by the male servants, the unmarried adult children of the house, or guests. In some cases the *shago* also opens directly to the outside in which case it might also be used as a living space by the house head or to serve as an office for running his business or workshop for practising his trade.

The *zaure* [49] usually although not always, leads to an open space called *ƙofar gida* where male social gatherings affecting the family, for example funerals, weddings, male circumcision ceremonies etc. take place. Again this is a male space. Where there are several families each with its section or *waje* several smaller *zauruka* (pl. of *zaure*) lead to respective family sections but where there is a single family the *kofar gida* leads to either the private apartment of the house head, called *turaka* or to another *zaure* which in turn leads to the main *tsakar gida* or courtyard. The *turaka* ideally consists of a living space called *rumfa* and one or more rooms . Also there is usually an adjacent toilet termed *banɗaki* .[50] The *turaka* is usually placed such that it commands the approach to, and could also be accessed from the inner parts of the house. Adult males close to the family might come this far because this is still part of the *ƙofar gida*, but this is the limit of all unrelated adult males however close. Anyone going beyond this place either has a mother or a wife (or both) inside the inner parts of the house.

Next is the *tsakar gida* or the central courtyard whose dimensions used to depend upon the size and status of the family. On to it open the ante-rooms called *rumfa* (pl. *rumfuna*), the *ɗaki* or room and the cooking place called *madafi*.[51] So also the toilet called *banɗaki* the grain storage

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[48] This is also the place where distant relations and strangers are lodged. The famous Hausa martial musician, Ɗan Anache, captures this spirit well in his early 1980's elegy, ***Ɗan Isa'*** thus;

Ɗan Anache ni kan na san ɗiyan mutane, sun sanni
Sakwkwato ko na taɓo kiɗi, kun dai sanni
Sakwkwato ko ba ni yin kiɗi, kun dai sanni
To kuma komi za'a ba maroƙi kun ban
Ɗan gida ba baƙo ba mai aje kaya zaure.

Meaning; I,Ɗan Anache am popular in Sokoto, regardless of being a musician. And every honour due to a musician has been bestowed upon me. For indeed I am family, not **an outsider quartered in a *zaure*.**

[49]Other names for this space include *soro*; *shigifa*; *kudandan* and *barga*.

[50]The *banɗaki* is also known as *bayan gida* ; *masai* ; *shadda* or *mazagayi*.

[51]The cooking place is also called *ɗakin dafuwa*; *ɗakin girki*; or *soron girki*. Where there is no separate room for cooking and cooking is done in the courtyard this place is simply called *murhu* i.e. the hearth.

called *rumbu*[52], and where available, the domestic animal pen called *turke* or the chicken cage called *akurki.* The *tsakar gida* is thus the focus of all activities in the house. This is usually the domain of the female space since no self respecting male adult would allow himself to be found here during the day time. It is here that one comes into contact with the females of the house. All the spaces adjacent to it including any *zaure* or *soro* is also regarded as belonging to the female domain. Thus it is not unusual for such a *zaure* or *soro* to be used by the females of the house for receiving adult male relations like fathers, brothers and sons from other marriages, or for living and for cooking. It used to be the case that where the next door neighbour is a near relation or socially very close, a door called *madudduka,* may be created that links the two adjacent courtyards thus allowing the females of the two houses direct access to each other without having to go through male spaces.

The *rumfa* which usually has the dual role of serving as a family living space and a transition space that leads to the *ɗaki* or room , also serves as a sleeping place for young children, for elder female children and or dependants. In addition female guests are received either in the *rumfa* or in *ɗaki* commensurate with their status or rank. In a house with several families the *rumfa* is usually the place where a married couple might meet during the day when it becomes imperative for them to confer because of its appropriateness; the *tsakar gida* is too public and out of bounds to the male while the *ɗaki* is too private with all the connotations that go with the word.

The *ɗaki* is the innermost and the most private part of the house. Besides serving as a sleeping place and a place for storing valuables it serves as reception place for highly honoured female guests. It is also the place where a married couple could meet and talk since in the *tsakar gida* there might be other females whose presence inhibits any form of discourse or intercourse.

The morphological hierarchy of the traditional city therefore encompasses the house interior, that of the noas - the open element, and the paranoas - the closed element. Thus one could visualise the morphology of the old city as composed of concentric elements[53]; The *gida* with a courtyard at its core; the ward with its *dandali* at the core; the block with its *fangali* at the core and the *birni* with its market at the core (Muhammad-Oumar 1979).

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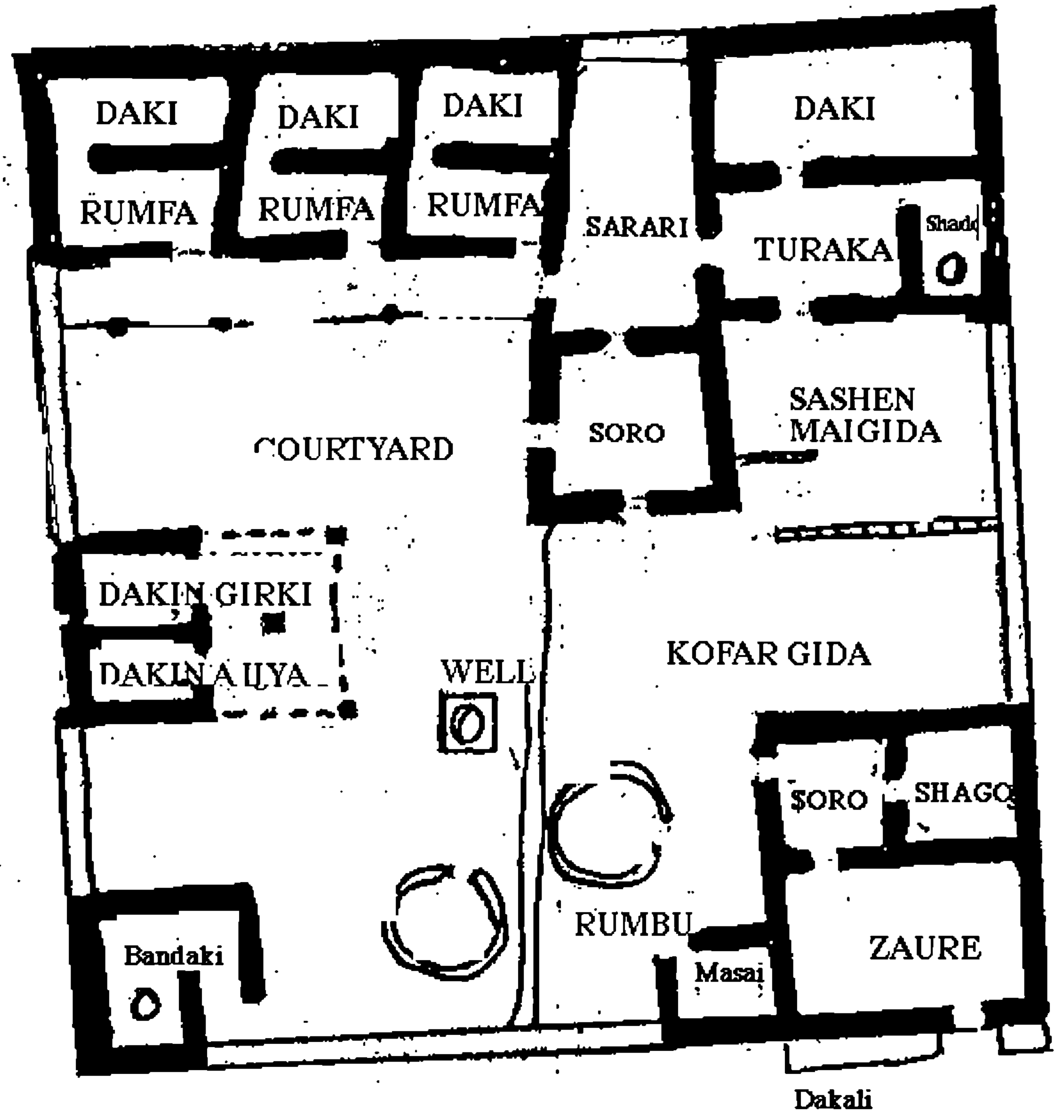
[52]The number and size of *rumbu* used to reflect the family size and or status, but nowadays , in most urban centres the *rumbu* is non-existent either because there isn't the grain to be stored or because of the pressure of lack of space. There might be a small room which serves as a store and is called *sito* from the English word store, whence the concept is adopted.

[53]See Muhammad-Oumar "Elements of Landscape Architecture in Old Kano City" (1979) Unpublished Department of Architecture (Ahmadu Bello University) Seminar Paper.



(After Sa'ad 1981:)

FIGURE 3.13 : Hausa Ideal House

3.5 Hausa Society And Social Life : *Yau da gobe sai Allah*[54]

Until the advent of colonialism the Hausa social system divided the populace into two main groups; the *saraki* or the aristocracy and the *talakawa* (sing: *talaka*) or the proletariat . Within these two broad divisions sub groups are recognised **(Figure 3.14)**. The *saraki* are either free-born or slave born. Within the *talakawa* one finds three main sub-groups; the *tajirai* (sing. *tajiri*) or merchants, the *masu sana'a* or tradesmen and craftsmen, and the *manoma*; (sing: *manomi*) or farmers who were the majority.[55]

[54] The meaning of this proverb is 'the vicissitudes of life require (the grace of) fortitude from God'
[55] As late as 1960 40% of Kano population identify themselves as *manoma* (Trevallion 1966).

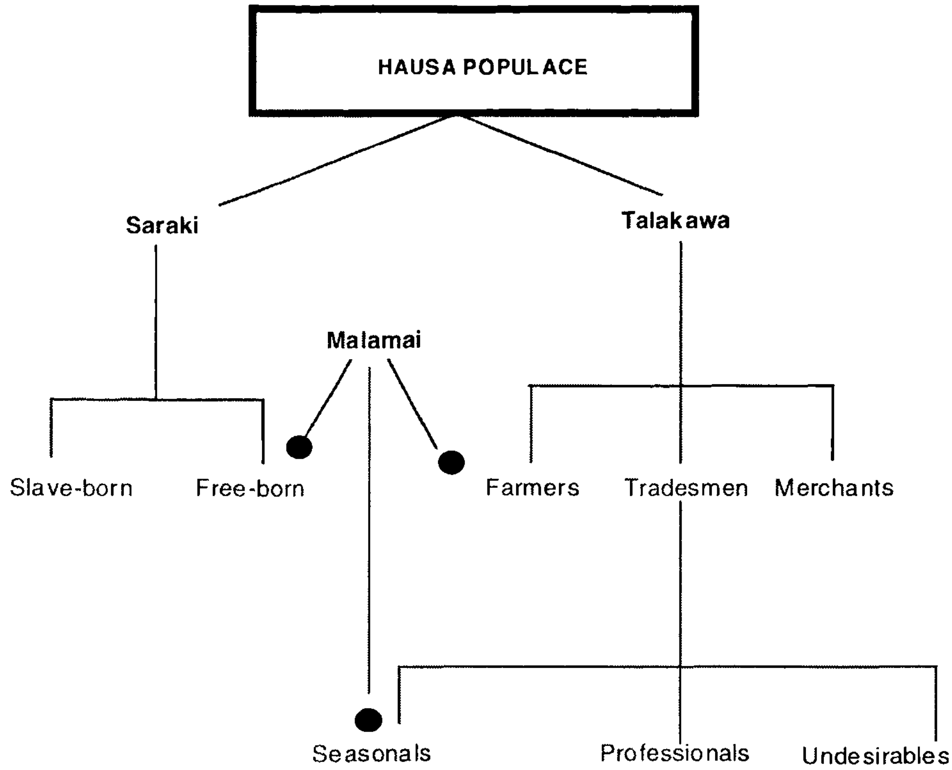


Figure 3.14: Hausa Social System

The *masu sana'a* could be further classified as being professional, that is those who rely solely on a trade for their livelihood, or seasonal, that is those who may get part of their livelihood from some craft but who by and large were farmers. There is a unique group that cuts across these two primary divisions. This is the *malamai* (sing: *malami*) or men of letters who are the custodians of Islamic knowledge. They were and to some extent still are, generally held in high esteem. Those that excel or are given public office are identified with the *saraki*. The majority however belong to the farming or seasonal trades sub- group.

Hausa social grouping saw changes in this century as a result of colonialism. While the two main divisions more or less remained, some reordering occurred as for example in the case of slaves. Because the colonialists abolished slavery, at least *de jure* if not *de facto*, slaves gradually became an insignificant part of the *saraki* group. However towards the end of colonialism a new sub- group that replaced the slave born *saraki* emerged; these were those who attained public office because of their western education and who became increasingly identified with the *saraki*. In Kano for instance, like in other parts of Hausaland, some of the educated elites have by 1975 surpassed the free born *saraki* in social stature such that their relationship with the *saraki* is not unlike that between the free born *saraki* and the slave born *saraki* in colonial times (Ibrahim 1988).

In the talakawa group the *manoma* sub-group shrunk in size while the tradesmen sub-group swelled as a result of new trades and crafts and the shift in economy. The order of the tradesmen sub-group also changed. In pre-colonial times textiles trade had probably the largest work force, but by the end of the colonial period unskilled and semi-skilled workers in the informal sector work force seemed to lead numerically (Paden 1973 : 27).

This social hierarchy strongly affects the Hausa pattern of occupation. First, there is a strong division of labour based on sex. Thus although agriculture used to be the basic Hausa industry women were almost totally excluded from it. Women might winnow the harvest but that was about the closest they get; they neither plough the field nor sow seeds. Likewise men are never expected to process or market food items, and those who do, like the butcher are regarded with low esteem[56]. This pattern persists to this day.

Second, the Hausa leadership group, the *saraki*, i.e. those involved with public administration and the senior *malamai* or the clerics, are not expected to be involved with any form of activity involving indiscriminate mixing with the general populace, for example commerce except indirectly through agents. In short no physical work is expected of the leadership group except military duties. To this day it is extremely rare amongst the Hausa to see anyone with substantive authority, going to the market (or the supermarket for that matter) to make purchases. The higher the authority one has the more one is expected to order goods to be brought to their houses for inspection and the less one is expected to bargain.

As in the past, the Hausa today are engaged in many types of crafts and trades, the chief crafts being textiles, leather works and smithing . But there are differences and today the Hausa concentrate on tailoring and cap making, leather crafts and light smithing (Pokrant {nd}. c.1980; Jaggar 1993). Women still hold the monopoly for food processing and catering as in the past, but nowadays they are less and less involved in cloth manufacturing and finishing. Likewise nowadays long distance trade has almost disappeared. There is less importation and wholesale trade and more retail trading (Dan'Asabe 1994).

As a result of colonialism and globalism many new crafts like watch repairing, TV and video repairs, automobile repairs, carpentry, photography and printing were introduced mainly in the urban centres, but by and large the Hausa have not been seriously engaged in these. This could be attributed to the Hausa disposition of passing on trade or crafts to their offspring and the early association of such new crafts with colonialism. Consequently these were considered non-Islamic

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[56] Those who disregard this social rule are usually the male transvestites called '*Yan daudu* , socially placed under even butchers and drummers.

activities and were left to the mainly Christian Nigerians from the south, a trend that has persisted to this day.

Retail trading is the only traditional occupation that has not lost out in the new dispensation. Males and females, adults and children all partake in it though from different perspectives. Males usually set up a stall or a shop and even a table in the market or high street. Sometimes a *shago* is converted into a canteen. Others still, who could not afford to do so conduct their business by itinerant trading or *baka* ; this involves carrying about a round pan, called *ate* , on which they display their wares ranging from cigarettes to chewing gum and toffees. For the Hausa, trading generally, is not restricted to the market places or shops. In fact high quality goods are usually traded where they are produced, in many cases at home.

The Hausa domestic group is centred around the *gida* or the house which may comprise of more than a single family usually closely related[57]. It used to be a man his wife or wives and his children, both adolescent and married adults that constitute a *gida*. In addition to these there are also several dependants and relations, especially elderly parents. In the urban areas this is found mainly, though not exclusively among the well-off and the *saraki* . A house which constitutes several families so related, is termed *babban gida* or Big House (Cf. Hill 1974. See infra **Chapter 5**). For the majority of the urban population however a *gida* contains a few, usually not more than three families, that may be only distantly related or even totally unrelated. Though not on the same scale, many Hausa rural areas are witnessing such changes in house composition and size (Goddard 1973). Whatever the case a typical Hausa house even today accommodates more than just a nuclear family.

In Hausaland today as yesterday, marriage is the norm rather than the exception. For it is through marriage that one attains independent status, socially and economically. One, male or female, is not treated as an adult until after the first marriage, the *rite de passage*. In fact the first marriage of both the male and the female youth is the responsibility of parents if they can afford it. Hausa marriages are virilocal and patrilocal and marriage between close kin, called *auren gida*, is still valued though not enforced. Where a marriage fails, and this is not infrequent[58], one is not expected to stay long without remarrying. Celibates are considered deviants in Hausa society.

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[57]In many studies on non-western culture the term 'household' is used in the sense of family whereas the word 'compound' is used instead of house. Throughout this work the use of family and house are retained unless otherwise stated. For a discussion on the merits and demerits of the use of such words and terms while discussing non-western culture see _Tipple G et. al. (1994). For a general discussion on households see Wilk et. al. (1984).

[58] Several factors are responsible for the perceived high frequency of marriages among the Hausa; first the ease of divorce and remarriage; second the so called 'extended family' system which makes it easy for mothers to leave behind their children and third the semi independent position of women vis-a-vis their spouses. However one suspects that the actual rate of divorce is much lower than generally believed.

The Hausa love and take pride in their children though they may not openly show it[59]. Adherence to the maxim, *yaro na kowa ne*, meaning a child's responsibility and training is a communal duty, makes it rare if not well nigh impossible, for a child to be without a parent or guardian. Adoption is common and it has always been, even where the child's parents are alive and capable of taking care of the child[60]. Due to the nature of the Hausa domestic life children are usually brought up collectively. Thus it is not uncommon for one's children and those of his servants to be brought up together and treated equally (Abdullahi 1986). Nor is it uncommon for an unrelated adult to chide a child observed misbehaving.

The Hausa norm for social intercourse does not sanction indiscriminate association of the sexes in public or semi-public situations. Adult males mix socially with adult females only if they are next of kin, or those related by marriage. Thus all those occupations and endeavours that will necessitate the mixing of males and females publicly are not encouraged. This segregation of males and females is what is responsible for the strict division of labour noted above. It is manifest in the still strong[61] institution of *kulle* by which women of marriageable age are not seen in public during the day, especially in the market. Outings by females to visit friends and relations are usually done at night except those that are absolutely necessary like going to the hospital. To maintain this institution it behoves men to provide women with all those things that they need, like water and wood-fuel, but could only get by going outside the house[62]. It is because of *kulle* that females conduct their businesses from their homes[63]. Where they need their wares to be taken to the streets or markets they do so through their adolescent children, usually females. This is as true of the urban milieu as it is for the rural.

Another salient fact about the strict division of labour among the Hausa, is that although females are expected to see to the general household chores and care of children, they are under no obligation to work for or aid their husbands in their (husbands') endeavour to make a living. Where they do render such services it is the accepted norm for them to be paid, except if they waive it, and they seldom do.

Social norms expect and encourage women to utilise their independent time to improve their economic situation[64]. They can raise capital and pursue any one of the not too few occupations

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[59]It is considered improper for one to show overt affection towards ones own children , especially the first born. However it is also considered proper and commendable to show affection to other children, especially those of the next of kin and to one's youngest child.

[60] In Hausa society like in many other Islamic societies, child adoption does not have the legal or social implications that it has in the West. Thus although the full responsibility of the child devolves on the person adopting, it does not imply the exclusion of the biological parents from the affairs of the child.

[61]According to Calloway (1984:431), " over 95% of the married women in Kano City live in purdah, or,.......*kulle*."

[62]It is interesting to note that this social outlook is also upheld by both the Maguzawa, the pagan Hausa, and the Christian Hausa, suggesting that this norm pre-dates Islam which also enjoins sex segregation.

[63]This what Hill (1968) termed 'Hidden Trade'. She estimated that in rural Hausa areas, this kind of trade exceeds that of the conventional market.

[64] That this concept is so well engrained in the social consciousness can be seen from the fact that a noted Hausa Pop singer, Barmani Choge's song, '*Sakarai Ba Ta Da Wayo*', (meaning, Stupid Unsophisticated Woman) was a big hit in the mid 1980's. The song whose opening line is, '*mata ku kama sana'a !*' (meaning, women, get involved in some business!) basically derides the woman who idles away her time without using it for economic self improvement.

considered their preserves. They have full control of their business and its fruits and they are not expected to cater for themselves however rich they may be. In fact it is not unusual for a wife to be richer than her husband, nor is it unusual for her to be owed money by him[65].

To conclude this section it might be profitable to look at the Hausa concept of the ideal life and how it relates to the house. What do the Hausa in general consider the good life ? What is the ambition of the average Hausaman ? Is it to have wealth, fame, or power ? For this we turn to the great Hausa poet and social reformer, Mu'azu Hadejia (1976:40), who successfully captured the Hausa idea of the good life in his poem, ***'Annamimanci, Luwaɗi da Ashararanci'***.[66] The penultimate verse of the poem reads;

Sutura, abinci, mutunci, lafiya Duniya
Ranar ƙiyama, musan ceto ga Adnanu

Which translates into :

" (The good life is but) shelter {from the elements}, nourishment, honour and dignity (and also) health in this life"
" In the next life, one gets to attain salvation ."

The Hausaman like millions of other humans the world over, puts priority on the basic necessities of life, food, shelter and good health. But these for him are not sought as an end in themselves, but as means to an end. That end is *mutunci* which in its base form means humanness; the quality of being human. The root of the word is *mutum* or human. Thus it means dignity, self-respect, honour, esteem etc. (Bargery 1934:808). For it is only when one is *mutum* that he is honourable, dignified and worthy of respect and whose association should be sought.

To the Hausaman, one cannot attain *mutunci* without *sutura* , which in its most basic form is the clothes one wears, hence the great care and pride a Hausaman puts in his clothing. *Sutura* also means protection from the elements in the form of a shelter, or the grave in which one is finally buried. In its abstract form it means propriety, as well as personal secrets, which if made public would be compromising. Thus one popular phrase in the daily prayer of a Hausaman is, '*Allah yayi mana sutura* ' i.e. ' may God grant us *sutura* ', i.e., clothe, protect us from the elements and keep our secrets.

Equally important in attaining *mutunci* is *abinci* . Specifically this is what one eats and drinks, i.e., every form nourishment, but also *neman abinci* or *hanyar abinci* both refer to means of

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65 An interesting fact associated with this is that one ward in the city is famous for having all its female population fully occupied (Darma 1993). This ward located in Fuskar Gabas, the East sector, is called *Lallokin Lemu.* It is situated quite close to the market (**Figure 3.7**). In the early 1960's girls used to favour suitors from this ward , for the simple fact that once they go to live in the ward they would be somehow occupied. It was much easier then, to learn and practise a trade in *Lallokin Lemu* than in most wards of the city.

66 This translates into, " Iniquity, Sodomy and Debauchery ". In this poem Mu'azu Hadejia focused on the evils that were gnawing at the Hausa social fabric.

livelihood. This idea of the importance of making a living is perhaps the reason why, the Hausa society has a very large number of different occupational groups, and what Smith (1959: 248) observed as, " the awkward Hausa practice of pursuing several occupations simultaneously."

The Hausa also value *lafiya* as an integral part of the good life, and a well known Hausa proverb claims, *'lafiya uwar jiki '*, i.e. health is the determinant of every effort. The Hausa love of health potions [67] is a clear indication of the importance the Hausa attach to health. But *lafiya* also means well-being, physical and mental soundness, peace and prosperity. Clearly *mutunci* avails one little without *lafiya* .

For the Hausa all these are sought and valued for their contribution towards *mutunci.* Therefore the highest compliment to the Hausaman is to be treated like a human. ' *An ɗauke ni mutum* ' i.e. ' I am treated like a human being,' is the highest acknowledgement and appreciation a Hausaman makes. Conversely the worst thing to a Hausaman is to be treated like an animal . ' *An ci mutunci na* ' i.e., I have been disgraced, is the same as ' *an maishe ni dabba* ', i.e. ' I am treated like an animal' (Cf. Kirk-Green 1973:10 -11).

The Hausa preoccupation with *mutunci* [68] goes deep. One cannot be good or successful without it. Kirk-Green in his excellent work (1973) on the Hausa concept of the good man, *mutumin kirki,* has listed 10 attributes that qualify such a man. Of these *mutunci* together with *adalci* and *hikima* rank as the highest .[69] Another extremely important implication of this concept of *mutunci* is that any newcomer to Hausaland would to a large extent, be treated with *mutunci* . Again Ɗan Anache expressess this sentiment well at the begining of his magnum opus ("**Ɗan Isa**" refered to above note 48)thus:

Shi wa Allah ba inda bai aje kaya nai ba
Ya tabaraka ba inda alkawal ko wajjen wa

Meaning,

For Sure God does everywhere hide His gifts.
Yeah the Good Lord grants covenants to all and sundry.

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67 The Hausa child is exposed to various herbal and bark potions, called *tsimi*, from the time he is born up to the age of nine. Again in his lifetime the Hausaman consumes various potions as he grows from middle to old age. This is as prevalent today as it was in yesteryears (See Schildkrout 1978).

68 The famous Hausa singer Mu'azu Dan Alalo, in his 1959 ode to King Umaru of Damagaram titled, *'Masu Wargi Su Fasa. Na-Garba Ya Kama Iko'* (Loafers Heed. Na-Garba Is In Command), epitomised the Hausa pre-occupation with *mutunci* thus;

In Sarauta Ta Danno, Talaka Koma Da Baya!
Nemi Ganye Ka Raɓe, Ka Gansu Basa Ganinka
Don Kar Su Ci Ma Mutunci !

Meaning : When authority looms, Commoners retreat! Hide Ye behind the bush. To observe but not to be observed, So that you are not disgraced.

69 Kirk-Green(1973) has tranlated *adalci* as scrouplous behaviour, and *hikima* as wisdom, but *adalci* is commonly taken to be the quality of being fair and just. Other attributes of *mutumin-kirki* are truthfulness, trustiworthiness,generosity,fortitude, intelligence,sensitivity and courtsey. The Hausa expect the first three from everybody and the last three, ie *mutunci, adalci* and *hikima* from only the noblest of all.

In the same vein the ordinary Hausaman is wont to say, *'ba a san inda baiwar Allah ta ke ba'*, i.e. everyone has his talents. Far from being treated as a barbarian or with suspicion, one would simply be treated as different[70]. Thus no one scorns the stranger's appearance[71], diet, clothing or language[72]. Even the stranger's ungrammatical use of the Hausa language would simply be treated as a dialect, rather than as corrupt *Hausa* . This is the major reason, among others, why Hausaland became a melting pot of sorts. It still is[73].

The Hausa also put high priority on personal salvation in the hereafter. Most Hausa are Muslims and have been for such a long time that Hausa society in most ways is Islamic. The influence of Islam on Hausa society is so deep that it is not easy to distinguish purely Hausa customs from those derived from Islam. Thus as part of the Islamic world view most Hausa subscribe to the basic daily rituals of prayer, the annual 30 days fasting and alms giving considered necessary for personal salvation. The Hausa consider it a great misfortune, and even sheer stupidity on the part of one who attains worldly things to the detriment of one's salvation[74].

This summarises the Hausa philosophy of life. The ambition of every Hausaman is to attain *mutunci* or honour and dignity, enough to be regarded as *mutumin kirki* (Kirk-Green, op. cit.) in his lifetime, and to die hoping that *aljanna* or Heaven is assured for him . In this quest for the ideal life, the *gida* or house is central to the Hausaman's *weltanschauung* . That this is so could be discerned from three key concepts and social constructs of the Hausaman.

First the attainment of adulthood and social identity is as we have noted, closely relates to the idea of marriage which itself is strongly predicated on the possession or control of a house[75].

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[70]In many societies the world over, a stranger is considered as uncivilised, hence names like *gaijin* among the Japaneese, *hottentot* among the Dutch. Even near the Hausa, the Kanuri to the east call all non-Kanuri, including the Englishmen who colonised them, *kirdii*, meaning monkey. The Hausa have no such concept. The closet to this that the Hausa have is the concept of *gwari*, meaning a simpleton.

[71]When Captain Clapperton visited Kano in 1824 he was deeply hurt when no one was impressed by his Royal Navy officer's full-scale ceremonial uniform . As Hallam (1966) pointed out, the Hausa were used to such, " ...outlandish strangers ...arriving everyday " .

[72]This is not to say the Hausa are paragons of virtue. Far from it. However the fact remains that racism is one concept the Hausaman totally lacks. The Hausa have three racial classifications; *fari* or white which includes Arabs, Fulani, Indians etc; *ja* or red which includes Europeans; and *baki* or blacks which includes the rest. Even then this classification lacks any order of superiority.One's superiority is judged according to the degree of *mutunci* one has. It is true some superiority is associated with Arabs, but as Paden (1973:38) rightly observed, this is more to do with religious values ascribed to the Arabs, them being associated with Prophet Muhammad - an association the Arabs in Hausaland lay on a bit thick - rather than some innate qualities.

[73]" The chief characteristic today in Hausaland is the tolerant and cosmopolitan atmosphere, an outlook developed by a thousand years of mixing with foreign merchants and conquerors.." (Hallam op. cit.). This testimony given 30 years ago by one of the Hausa 'conquerors' is as valid today as when it was given.

[74] The great contemporary Hausa poet Alhaji Aliyu Namangi (1981:11) has described the person who sacrifies the hereafter for worldly gains in a verse from his great epic, ***Imfiraji*** (Book Two) thus;

Yai ma kai mugun hasara
Ya bi mummunar dabara
Ya ɓace da rashin basira
Sai shi zo da dubun larura
Shi faɗi ba za ta karɓuwa ba.

Meaning ' He lost out his soul; He followed a pernicious counsel; He lost out for lack of wisdom and insight; He would present numerous excuses ;That (in the hereafter) would be totally unconvincing.

[75] In rural Hausa the expresion " *an yi wa wane gida* ", meaning a house has been made for so and so, is sometimes still used as a euphemism for geting married.

Thus we see every respectable male adult identified by the word *magidanci* which literally means home -maker or householder. Its variant is the word *maigida,* meaning home owner, and used as a title not only for the head or senior man of a house but also for any respectable adult, similar to the way " mister " is used by the English[76]. Similarly "*uwargida* " is the title for the senior wife, or for any unfamiliar respectable woman similar to the English word madam.

Secondly, the *gida* is socially contrasted to the market. The house is socially exclusive and is considered a place of respectability where one commands the highest respect, as opposed to the market place where rank and decorum breaks. The house then could be said to constitute one's social garment and a pre-requisite for *mutunci* or social respectability. It is thus not surprising to see the Hausa investing more in the *zaure* or entrance hall than in any other part of their dwelling.

Thirdly, Hausa culture is essentially urban (Sa'ad 1986; Mahadi 1989). It is therefore only natural that the house should feature strongly in the socio-cultural conceptions of the Hausa. It is closely related to the idea of culture and civilisation. Thus *bagidaje,* from the word *ba* signifying negation , and the word *gidaje* meaning houses[77] is the word used to refer to the unsophisticated or uncultured person. Similarly the rural populace are identified by the word *gidadawa,* from the word *gida* meaning house, and the word *dawa* meaning bush[78].

Finally, the concept of supreme deity , is strongly associated with the concept of the cosmic home, the *giji* [79]. God is *ubangiji* that is the-father-of-the-cosmic home, from the word *uba ;* father , and the word *giji* ; home. Thus the concept of the house or home is at root of both the cosmic and the social conception of the Hausa *weltanschauung* . In sum one could say that no Hausaman, or woman for that matter, comes of age or is *inter pares* socially fully-fledged without having or controlling a household. For this is the first step towards the good life.

[76] In the last half century as a result of the increasing number of those performing the pilgrimage to Mecca, the word " *alhaji* " meaning pilgrim, has gradually replaced the word *maigida* as a title for a respectable adult. It is still used however, as a title for the head of a house.

[77]Crudely this translates as one with no house

[78] Crudely this translates as those with houses in the bush.

[79] Although the word *giji* and the word *gida* both mean house or home, *giji* is usually used for the esoteric and abstract concept of the house or home whereas *gida* is used for its physical and social concept.

CHAPTER FOUR : METHODOLOGY

4.1 Approaches To The Study : *Space, The Final Frontier*

The study of the built environment could be approached from basically four broad theoretical stands as stated in the previous chapter. To recapitulate these are :

- the nature and form of the built environment is the result of human adaptation to the natural environment .
- to make and express meaning out of the environment
- conceptions of the self and the resultant behaviour
- social production and reproduction.

Variations on these basic theoretical perspectives lead to three major, though not exclusive, methodological approaches for establishing a definite and verifiable basis for recording data and offering hypotheses, which may be the starting point both for practical reasoning and speculative reasoning. For in the words of Martin (1967: 191), "it is speculative reasoning that makes rational thought live; and its rational thought that gives speculative invention its basis and its roots" . The three methods for the study of buildings as artefacts, and by extension domestic architecture, are: descriptive; evaluative and qualitative [80]. However in actual terms, these three approaches need not be, and in fact rarely are, mutually exclusive, and in many cases it is possible to combine them because they supplement and complement one another. What distinguishes one study from another is the degree of emphasis from one approach to another.

In the descriptive approach the architecture of a society or group is studied without going into the validity or otherwise of the form, function or organisation of the architecture. This has been the traditional method most commonly employed by architectural historians and professional architects in the west until recently. Analyses of this nature systematically order and classify houses chronologically and or geographically. There are usually no value judgements made because the scholar has very little input, if at all, in the valuation of the architecture. Thus while systematic, this approach is rarely analytic. However, although it may restrict a trans-cultural interpretation and evaluation of architecture itself, it does give a means of accurately recording, though not necessarily understanding the architecture in question. Where explanations for the resultant architecture are offered they are usually attributed to physical factors; climate, terrain,

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[80] See Ladd (1973:421) who used the same terms tough in a different way while discussing theoretical stands in art appreciation. See also Zevi (1957:214-224) who uses the terms content, physio-psychological and formal while discussing interpretations of architecture.

building materials or technology. This as has been demonstrated (Rapoport 1969), cannot give a full account of any form of architecture.

Perhaps the earliest known work on domestic architecture is of this nature. This is the work of the renaissance architect Sebastiano Serlio (Serlio 1611 / 1978) which is a catalogue of the various houses he was familiar with in his native Italy, from the grand house of the king to the most humble house, that of a' poor artisan'.

By its very nature this was a descriptive work par excellence with little attempt, if at all, to understand what the houses meant or how (not in technical , but in social terms), and why they were constructed. However it is a great work since it was the first to shy away from the dominant paradigm of looking only at monumental architecture.

Many works followed the footsteps of Serlio, bifurcating however into two main camps; the formal and the typological. Buildings are classified aesthetically and functionally and ranged chronologically in the formalist approach or geographically in the typological approach. The spatial elements of such buildings are then described by their formal properties i.e. shape, size, proportion, construction materials and technology but above all, decoration or treatment of the facade. The works of Pevsner (1943) and Brunskill (1987) are two good examples of formal and typological approaches respectively.

The evaluative approach aims at understanding and explaining the architecture of a society in terms of its relationship to the socio-cultural milieu in all its complexity. As we noted in the preceding chapter, from about the mid of this century emphasis in the study of built environment shifted from the study of monumental architecture to architecture as social process and or product paradigm. Studies by architectural historians and architects were completely overshadowed by studies done by other than these professionals and most of these works were methodologically evaluative. The explanations put forward to account for variations in house forms, functions and organisation were many and equally varied. The earliest explanation put forward was the evolutionary account of houses. This posits that the house evolved through a slow but gradual process from the simplest form of shelter to the most complex. As one scholar [81] put it, this is a ' cave theory ' of architecture. An example of this is the work of Bemis and Buchard (1933) which attempted to trace the development of the house from the earliest times to the beginning of this century. Not unexpectedly it is imprecise and more often than not, over generalises.

Closely related to this is the cultural diffusionism expounded by the German *Kulturkreise* school and adopted by others, especially the early American ethnographers. Its principal argument is that interaction between different socio-economic groups leads to new ideas generated by the higher social group, which is then copied by the lower social group. In architectural terms, both new and

[81] Hillier B; remark made at a departmental seminar May 1993.

social group, which is then copied by the lower social group. In architectural terms, both new and existing architecture develops in a region or locality as a result of the introduction of new ideas by foreign people. As noted earlier the works of Moughtin (1985) and Prussin (1986) fall into this category. Fortunately many studies have demonstrated the spuriousness of this kind of argument, for example Douglas (1972).

However there have been many good evaluative works that systematically explored the role of architecture in determining social function, enhancing or inhibiting social relations and or interaction, and vice-versa. The means used to study domestic houses were many and varied, ranging from synchronic and diachronic comparisons (Mercer 1975; Smith 1975) to the congruence of socio-cultural factors such as kinship (Schwertdfeger 1982), gender relations, economic and development cycle relations (Wilk 1990), and social organisation (Kent 1990) . Each of these offers an appropriate socio-cultural explanation for the nature of the observed environmental form. This approach has gained ascendancy from the middle of this century and has produced the most prolific works. Some of the most promising advances in the field of domestic architecture were made through this approach.

The qualitative approach is concerned with the attributes of the architecture in question. It attempts to present means of encoding and hence comparing the underlying intangible but expressive cultural features; i.e. those collectively shared unconscious mental constructs that are manifest in the multitude socio-cultural patterns of behaviour. One of the most well known and influential works in this genre is the seminal work of Glassie, aptly entitled **Folk Housing in Middle Virginia** (1975). Because of the importance and far reaching consequences of its ideas, there is need to delve into the work in more detail.

Glassie's basic assumption is that artefacts, especially those associated with time and space are the best means of unravelling and understanding a culture since they are expressions of it (ibid. :12). Glassie then proceeded to abstract and generalise rules that would account in the simplest manner for the design of the Middle Virginia houses. The end result is a list of 9 major geometric and configurational rules, and nearly a hundred sub and sub-sub rules which in summary aggregate into 17 basic house types or templates. Although the end result is a kind of typology of Middle Virginia houses, Glassie was not concerned with the typology of houses which he rightly denounced as a shallow means of abstraction (ibid.: 33), but with the generative rules behind them. These rules of combination, although mathematical in essence, were used unconsciously according to Glassie , not unlike the way one uses language to generate sentences using the unconscious rules of syntax (ibid.: 35-36).

The importance of this work lies in its abstracting the relational characteristics of the Middle Virginia houses through the rigorous analysis not of the nomenclature of spaces or constructional elements but spatial configuration. It demonstrated the existence of a common configurational quality underlying the design of the houses in Middle Virginia. This quality, according to Glassie, is more the result of the cultural disposition of the Middle Virginians rather than their environmental or behavioural needs (ibid. :119 -122).

Like Glassie, the works of Mitchell & Stiny focus on the configurational qualities of buildings abstracting what they termed *parametric shape grammar* (1975;1978 {a, b, c & d}). According to them, " Shape Grammars are defined over alphabets of shape and generate languages of shapes." (1978a :128). Shape grammar presents a recursive procedure for the generation of building plans and or elevations, but not for retrieving same for trans-configurational analysis or comparison. This is because the rules that define shape composition vary from one building form to another even though they are consistent for a particular building plan and or, elevation. Parametric shape grammar is perhaps most useful, in describing the layouts and facades of buildings in stylistic terms, but it is less useful in describing the functional morphology of buildings, or in qualifying the socio-cultural relationship between buildings and their milieu.

Steadman's work (1983) also explores the generative configurational properties of rectangular building plans and their limitations. Various methods for transforming rectangular plans through addition, subtraction, dissection etc. are explored. Although mainly theoretical in approach, Steadman did discuss the possibility of applying the principles outlined in design and in the analysis of historical buildings. A later collaboration with Brown did demonstrate how to understand, "the relationship between the different plan configurations and the forces - social, technical and functional - that shaped them" . The result was an outline of the constraints that applied in the design of the houses analysed. The efficacy of this method as the authors stressed, lies in its reliability as a tool for comparing the possible against the existing (Brown 1987: 407 - 438).

Two new ways in the qualitative approach to the study of domestic architecture are the methods of fractal distribution analysis (Bechhoefer & Bovill 1995) and structural logic (Coudart 1995). Taking off from the basic premise of fractal geometry, i.e., " mathematical shapes that display a cascade of never-ending, self-similar, meandering detail " Bechhoefer & Bovill (1995:2) analysed the visual characteristics of the traditional domestic architecture of Amasya, Northeast of Ankara Turkey by fractal decomposition . The method they used is termed box-counting, which measures the self similarity over the specific scale range and how this changes from the large to the small scale of the boxes used (ibid. :4)[82]. The aim is to discover order within seemingly random

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[82] The fractal dimension F_d of a building facade is given by

$$F_d = \frac{\log Nb_s - \log Nb_l}{\log Nb_{as} - \log Nb_{al}} \quad \text{where}$$

Nb_s = number of boxes with lines in them at the smaller box size
Nb_l = number of boxes with lines in them at the larger box size
Nb_{as} = number of boxes across the bottom ot the smaller size grid
Nb_{al} = number of boxes across the bottom of the larger size grid

variations in the visual richness of architecture [83]. Their findings are that traditional buildings were built in a way that maintained the textural depth that nature displays and hence compared to modern housing schemes were closer to nature. However as the authors rightly pointed out, " fractal distribution is an idea-generation tool like sketching," which may be used as an aid to the design of, "clustered rhythms similar to the variability in nature and in indigenous designs" (ibid. :7).Thus while this method offers an interesting means of description as well as comparison, currently it is still too much in its infancy to be of significant use, but the possibilities are there.

The method of structural logic aims at identifying and ordering the relative values of the architectural elements that structure a particular domestic architecture (spatial structuration and codification par excellence), in terms of two analytic categories (Coudart 1995:3) ;

a. architectural elements manifest in one form only or which vary within a range of culturally determined options.

b. architectural elements which vary randomly in form from one house to the next, depending upon non-cultural contingencies.

Coudart posits that in any given architectural tradition the first-category architectural elements invariably exceed the second-category architectural elements, hence it is possible to do intra-cultural descriptions and trans-cultural comparisons.

Once identified, the elements that constitute the structuration of the domestic house could be used to assess the degree of stability or sustainability as well as the degree of flexibility or resilience of a cultural tradition because as she hypothesises;

a. the number of forms which an architectural element may assume is a function of its transformability; the more the variants of the form the easier and speedier the change.

b. the more the number of the invariant or culturally limited architectural elements the higher the cultural persistence, and vice-versa.

c. the more the balance between the physical and the social importance of an architectural element tends towards the physical the easier it can be changed though not necessarily so.

To demonstrate the trans-cultural and trans-chronological applicability of her method Coudart considered two houses one historical, from the Danubian Neolithic culture in Europe, circa 6th. to 5th. millennia BC and the other anthropological, from the contemporary Anga people in Papua New Guinea. She concluded that there is a strong correspondence between the degree of variation

[83] Although concerned only with the visual aspects of architecture, it is not impossible to use the same method for analysing the plans of domestic houses.

of the architectural elements of the dwelling and the cultural sustainability of a given society. The trans-cultural and trans-chronological rules that this suggests cannot be used, she cautions, to predict or retrodict socio-historical events but only to indicate the realm of possibilities (ibid. :10). This method like the fractal analysis discussed above, is interesting but currently of limited application due to lack of clearly defined parameters for determining what constitutes an 'invariant' element. In addition, its theoretical assumptions incline it more towards diachronic rather than synchronic analysis; i.e. changes and transformations rather than socio-cultural statements of here and now.

4.2 Space Syntax : *The New Frontier*

By far the most successful of the qualitative methodologies is arguably that of *Space Syntax* (Hillier & Hanson 1984). Its central argument is that buildings and settlements are both functional and symbolic artefacts that constitute as well as express society in the way they configure spaces. To state their principal axiom, " *spatial organisation is a function of the form of social solidarity* " (ibid.: 142). Thus the built environment by its very nature is an embodiment of the social logic. For them buildings are more than just commodities but the embodiment of space transformations hence the ordering of space is also the ordering of social relations. This, i.e.. " to see space as a neutral container rather than a social act" [84], is what they term the man-environment paradigm, a misconception of which leads to the separation of, " the problem of meaning from the intrinsic material nature of the artefact.....and....the human subject from the environmental object." The result is the paradox, " of finding a relation between abstract immaterial 'subjects' and a material world of 'objects' " (ibid. :9). In sum, the physical environment is de-socialised while the society is de-spatialised.

From these theoretical premises Hillier and Hanson were able to present and demonstrate a set of related basic rules of combination capable of generating spatial patterns that can be expressed mathematically irrespective of shape or size. Herein lies the major distinguishing mark of Space Syntax. Hillier and Hanson were not the first to propose the idea of space and its organisation as the key to the understanding of buildings as Zevi (1957:216) noted, but perhaps the first to propose clearly defined analytical techniques for quantifying this. Most of the other spatial interpretations tended to be formalist or aesthetical [85]. The analytical methods of Space Syntax are based on the concept of *spatial configuration* which is simply defined as the relation between one space and another given a third.

A full exposition of the theory and methodology of spatial configuration is beyond the scope of this work. Fortunately it has been expounded in detail in the various publications dealing with Space Syntax (Hillier & Hanson 1984; Hillier et. al.. 1987 etc. etc..) to which reference should be

[84] Hanson JM 1996, personal communication.
[85] See Frankl,P (1970: 161) and Brown F in Samson (ed.) 1990 (pp 259-276).

made. However because of its importance a simple explanation of that aspect of syntactic tools and terms relevant to this work is necessary. Spatial configuration is defined as the relationship between a finite number of spaces, convex or axial, in a system or complex, taking into account all the other spaces in the architectural or urban system (**Figure 4.1**)[86]. A convex space is defined as that space with the property that any three points within it are inter-visible [87] (**Figure 4.2**). Relations are created between convex spaces by spatial connections syntactically termed *permeability gaps* or *links* . To compute the configurational properties of a system or complex the fattest and the fewest convex spaces are mapped out on the architectural plans of a house or building together with the permeability links between the spaces; this is termed *convex map* or permeability diagram. Similarly on the map of a settlement the longest and fewest lines are drawn axially across every convex space; this is termed the *axial map.*

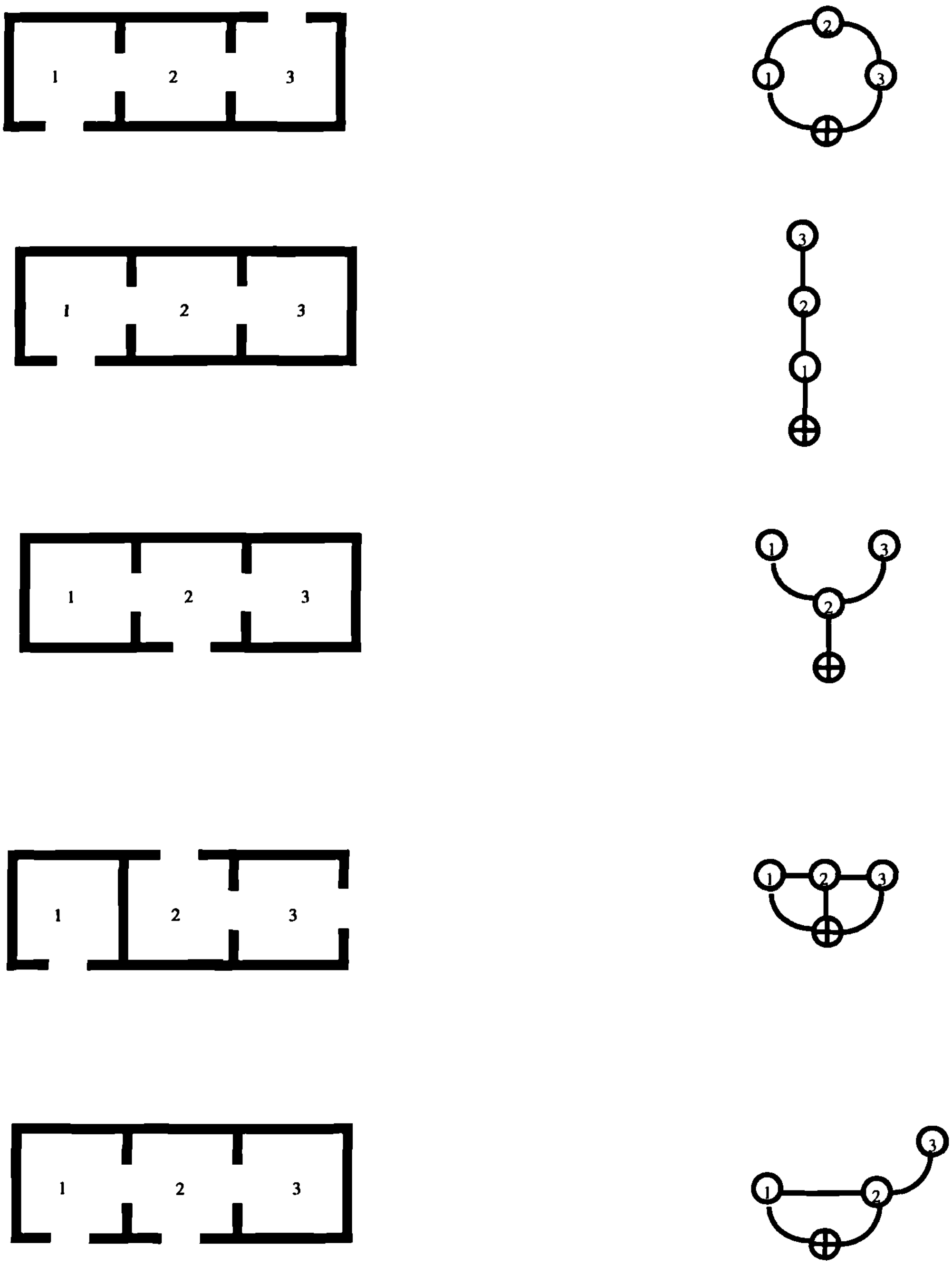
Two ways are then employed to describe and quantify the system's configurational properties visually and mathematically. The visual representation of a permeability diagram is termed the *justified graph* of the system and on it every convex space is represented by a node and every link by a line. A justified graph is drawn by selecting a space in the system as the root - usually the outside of the house. Next the root is linked to all the spaces directly permeable to it to form the first level, the root being at zero level. Spaces on the first level are then linked to the spaces directly permeable to them to form the second level and the procedure is continued until the n-th level. The position of a space or its *depth* depends on the number of steps taken to reach it from the root . The other syntactic property immediately perceptible from a justified graph is that of *choice* which is the system's degree of *asymmetry*, or the availability of alternative routes that link one space and another .

These two properties , i.e. depth and choice, are used to determine mathematically the basic quantitative measure of spatial configuration termed *relative asymmetry* (**RA**) or *integration* which ranges from 0 to 1; the higher the numerical value the less the integration and vice-versa. The converse of integration is termed *segregration* and also ranges from 0 to 1; the higher the numerical value the more the segregration and vice-versa. For simple systems the values of integration in a given system are computed from first principles (see **Appendix 8**) , however for complex systems an algorithmic computer programme is used [88]. For comparative purposes RA values are corrected for size to obtain *real relative asymmetry* (**RRA**) in order to account variations across different systems. The value of integration measures the overall spatial

[86] Of the several ways of representing space, convex and axial are used the most. While axial space representation is more appropriate for urban systems, convex space is most appropriate for domestic or indoor spaces.

[87] Mathematically a convex space is defined as that space with the property that," no tangent drawn on the perimeterpasses through the space at any point (Hillier & Hanson 1984:97).

[88] There are various computer programmes designed and developed by Mr. Nick (*Sheep*) Dalton of the UAS computer unit. Of these **Axman**, **NewWave**, and **NetBox** have proved to be the most successful. Others are **Pesh** and **SpaceBox.** This work is deeply indebted to Mr. Dalton.

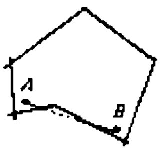


(After Hanson & Hillier 1979)

FIGURE 4.1 SPATIAL CONFIGURATION & PERMEABILITY PATTERN

(a)

(a) Convex Space : No line connecting any two points within the space goes outside the space: Inter-visibility of any three points within the space.



(b)

(b) Concave Space : Possibility Of a line connecting two points inside the space going outside the space.

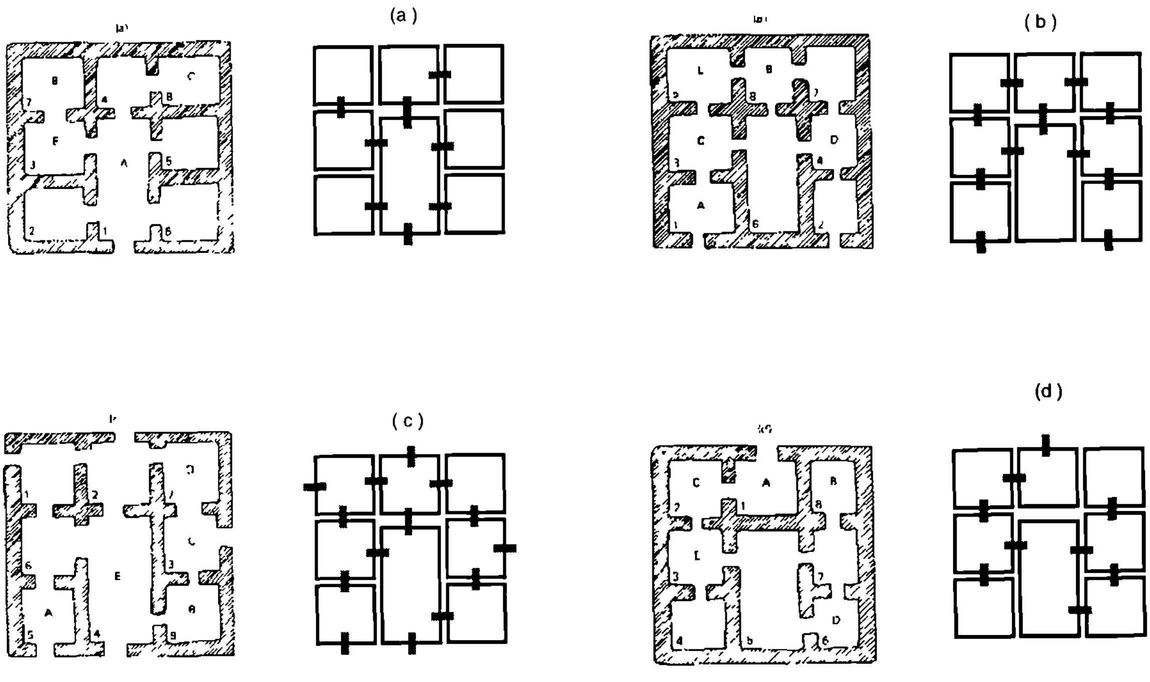


FIGURE 4.2 :CONVEX SPACE DEFINITION / CONVEX SPACE BREAK -UP

(After Hillier & Hason 1984 : 150)

or *global* configuration of the system since it takes into account every space in the system under question. Another syntactic parameter, termed *control*, is developed to measure the immediate spatial or *local* configuration of a defined space (**Appendix 8**) .

Integration then is the numerical value that defines a functional space by virtue of its locus within a system, because " different functions or activities in a dwelling are assigned to spaces which integrate the complex to differing degree" (Hillier et. al. 1987: 364). Thus configurational analysis is geared towards establishing the degree of restriction necessary to generate the observed pattern in an otherwise random process. And this is done by trying to detect consistency in the order of integration in a sample. Where it is detected, this consistency is termed *inequality genotype* and is assumed to express the spatio-cultural characteristics of a given society. To measure the degree of any genotypical relationship between three or more spaces, in comparison to the theoretical structure in the system, Hillier et. al.. (1987) used a modified Shannon-Weaver equation for transition probabilities and termed this *base difference factor* (**BDF**). Numerically, this ranges from 0 to 1 for three spaces[89]. Small differences in the RRA values between the spaces leads to BDF values close to 1, which is interpreted as a less structured genotype and hence weak. Conversely, large differences lead to BDF values close to 0, interpreted as a more structured genotype and hence strong.

Since its formal promulgation more than a decade ago, the concept of spatial configuration has received a lot of attention and its techniques have been used successfully to analyse as well as assist in the design of various buildings (Al Bahar 1990; Trigueiro 1995) and settlements (Loumi 1988; Zhian Fe 1994) the world over . However it has also been criticised both on its theoretical propositions and on its analytical techniques.

One of the earliest criticisms levelled against Space Syntax is the extent to which the built form can be used to deduce social organisation without reference to socio-historical facts. Leach disagreed vigorously with the assertion, " that an analysis of the syntax of a settlement pattern will tell us something about the social structure that was peculiar to the society that devised the settlement pattern in the first place." for in his opinion one cannot, " infer the generative syntax simply by looking at the lay-out of settlement patterns on the ground, and even if one could be sure of what the generative syntactic rules have been, one cannot infer anything at all about the society that makes use of the resultant settlement" (1978:397). To this Hillier et. al. replied that Space Syntax theory like every theory does not, " describe particular realities: only the underlying morphological constraints under which particular realities hold " and to insist that theory, or any theory is successful only, " if particular realities correspond to particular elementary structures," is to miss the essence of theory itself. The aim of Space Syntax theory was to develop useful

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[89] The 3 spaces used for a system are usually the maximum, the minimum and the mean integration values; see Hillier et.al. (1987) for a discussion of the formular and its application.

analytic tools for the decomposition and analysis of complex realities" (Hillier et. al. 1978: 403 - 404). And no doubt in this they have been successful.

Another criticism that Space Syntax has been subjected to time over time (Lawrence 1990a;1990b) is that its use of graphical representation tends to make it deterministic thus limiting its analysis to spatial configurations only to the detriment of socio-cultural and socio-psychological factors . Again, although the use of graphs may and does simplify complex spatial systems for comparative purposes, it leads to the loss of certain information about the subject of study (Brown 1990:95), for instance the representational parameters of architecture (Al-Bahar 1990:62).

Similarly the emphasis on physical connection, or its lack thereof, between spaces as a means for determining relationship, relegates and even ignores other forms of spatial connections, for instance visual, auditory and olfactory connections which may in some cases be as, or even more, important. To be fair, Space Syntax does propose a means of assessing the visual field by the use of isovist[90] and intelligibility [91] in buildings and settlements respectively but not the other forms of connection. Even then not in an adequate enough way. But as pointed out by Hanson, since Space Syntax is about relationships, there is no reason in principle, why other sensory data cannot be mapped. That this has not been pursued is, she believes , because no one has found it sufficiently interesting to attempt. She concludes that this indicates the relative value of this line of thought.[92] Thus Space Syntax as yet, lacks the means of quantifying aesthetics[93] (Muhammad - Oumar 1993:41-42).

The latest criticism levelled against Space Syntax is that of cultural bias in the interpretation of numerical results. It has been argued that although the analytical techniques are simple if tedious, objective and easily replicable, the interpretation thereof is subjective and hence controversial (Teklenburg et. al 1992; Osman & Sulaiman 1994). Osman & Sulaiman contend that the method of Space Syntax," does not seem to yield much of the full scope of interpretation outlined by the pioneers..........in the unravelling of social norms behind the morphology of buildings" (ibid. :190) and concluded that, " unless supplemented by social science methods......(it)...is incapable of eliciting cultural norms" (ibid. :201) .

A modification of the Space Syntax methodology was proposed in order to address this problem. Osman's PhD dissertation (Osman 1993) had the twin aim of identifying common morphological patterns and establishing the role of culture in the performance and ordering of domestic activities of the houses she studied in Omdurman, Sudan (ibid.: 2). Despite her lack of proper grasp of the

[90] For a full discussion on isovist see Benedikt (1979), ' To take hold of space: isovists and isovist fields.'

[91] This is the measure which captures the 'intuitive sense' of the presence or absence of 'structure and intelligibility' in a spatial settlement. See below for more details. Also Hillier (1989;14).

[92] Hanson personal communication (1996).

[93] Hillier is currently developing the concept of *layered tessellation* Hillier (1996) but as yet it is still in its infancy and it remains to be seen if it will account for the tactile aspects of the built environment when fully developed .

basic principles of the Space Syntax methodology, for instance syntactic hierarchical ordering of spaces, she was able to obtain some admirable though convoluted results.

The argument that Space Syntax has not captured all of the inner logic of the built environment is acknowledged by Hillier who counters that this is just a matter of time and expressed satisfaction, not only at the current state of affairs in the application of the Space Syntax methodology in architecture and urban design, but also at the trend of interest shown in its application across a range of disciplines (Hillier 1996). That in its interpretations Space Syntax is guilty of cultural bias has not been adequately demonstrated by either Osman (1993) or Osman & Sulaiman (1994), as discussed elsewhere (Muhammad-Oumar 1993). There it was shown that any perceived 'misfit' is more the result of a lack of grasp of the tenets of Space Syntax.

Despite these reservations however, Space Syntax is still powerful enough to continue serving as a tool for spatial analysis in various fields from archaeology to architectural design, perhaps because" architectural space is...a concretisation of the existential space" (Pearson & Richards 1994 : 4).

It is agreed that the method of Space Syntax, though a very powerful tool for the description, comparison and analysis of spatial patterns, is not by itself adequate enough to give the whole story . There is indeed a need to modify or supplement it as the case may be. This is perfectly acceptable for as Trigueiro acknowledged," any of the analytical procedures can and must be reworked to account for changes....or simply a new ...perspective..." that is being investigated (1995: 47). Yet inspite of this statement Trigueiro was happy to use Space Syntax methodology without modification; so did Orhun et. al. (1995). Others (Al-Bahar 1990; Osman 1993) felt the need to, and attempted to modify it.

4.3 Research Methodology

As noted and proposed (e.g.. Al-Bahar 1990; Osman 1993) but not fully demonstrated, what is needed is a methodology that will examine the configurational, the formal and the socio-cultural properties of domestic space form . Space Syntax is so far, if not the best, certainly the most successful of the configurational analysis methods. However it cannot account for certain formal architectural and aesthetic properties of domestic architecture necessary for the definition and assessment of other aspects of socio-cultural determinants, to wit the provision and allocation of space; the individual and communal use of space; the social conception of space and the physical appreciation of spatial qualities at the micro and macro levels [94]. It is set out hereunder the methodology used for the study of the Hausa domestic house as exemplified in the case of the Old City of Kano. This will include the selection of the houses; the conduct of field work ; limitations of the work and the process of analysis;

[94] Hanson (personal communication 1996) contends that Space Syntax observation methods could be used to elicit socio-cultural aspects of domestic architecture,but admits that this is perhaps not as efficient as it should be.

4.3.1 Selection of Houses

For convenience and simplicity the administrative demarcation of Kano into sectors based on the four cardinal points, North, South, East and West, is used. In order to select the houses for analysis the city wards (See Chapter 4 below) were first, identified by the dominant trade or profession, or by the ethnic identity or origin of the residents. A representative sample of wards was then selected from the four sections of the city [95]. In selecting the wards four major trades or professions and five ethnic identities[96] were used as bases. The trades are smithing (black and /or silver), trading (merchants, brokers and petty trading), crafts (leather works, tailors etc.), and specialised skills (civil servants, *mallams* etc.). The ethnic groups are Hausa, Fulani, Kanuri, North Africans (Berber; Tuareg etc.) and others that do not fall into either of these.

Table 4.1: Ethnicity Versus Trade Matrix For Wards Selection [97]

Ethnicity Trade	Hausa	Fulani	Kanuri	N.African	Others
Smithing	L Makera Dala	K Mabuga Warure	Dukurawa Diso	T.Makera Zango	Zango Darma
Trading	Koki D.Arbabi	Sheshe Yakasai	ZBarebari Gabari	Dandali T.Makera	D.Arbabi K.Mabuga
Crafts	Adakawa Gabari	S.Dinki Danbazau	B. Zuwo Danbazau	Chediya Jingau	U. Gini T Nufawa
Others	Madabo B. Ruwa	Yakasai Darma	M. Ganari B. Zuwo	Alfindiki Sharifai	T Nufawa SM Nagge

A matrix of ethnicity versus trade was then constructed (**Table 4.1**). For each cell two wards were chosen. The total number of wards possible is 40 (4 x 5 x 2). However some of the wards could fit into more than a single cell. For example **Kwarin Mabuga** is both a smithing and a trading ward and is populated by many ethnic groups the dominant being Fulani. The total number of wards selected was 30. {**Appendix 2** is a list of the wards each with its brief description, history and social peculiarities.}

Second, using cadastral maps of Kano City at a scale of 1: 1000, a sample of 5 to 7 domestic houses was tentatively selected from each ward for analysis making the total number of houses to be analysed 150 to 210 units (30 x 5 / 30 x 7)[98]. The houses were selected to reflect the matrix of the four major trades or professions and the five ethnic identities . For example the house of a

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[95] Until the local government reforms of 1977 Kano city was divided into four sections or districts corresponding to the four cardinal points, that were administred by the city council (Paden 1973:19-20).

[96] Trade here will refer to the subject's means of livelihood as opposed to what skills he/she may have while identity refers to what the subject percieves or takes him/herself to be rather than what he/she is percieved to be.

[97] The reason behind this apparently unequal distribution of wards is that the Eastern and Northern sectors are the oldest part of the birni and the most populated , while the Western and Southern sectors are the more recent and the least populated (Frishman 1977:260).

[98] The need for the sample of houses to be sufficiently structured to reflect both occupational and ethnic differences and at the same time to be statistically manageable made it necessary to desist from using purely random sampling. However within these limits the selection of the houses was made as randomly as possible.

Hausa blacksmith was looked for as well as a Kanuri blacksmith and an Arab blacksmith etc. The same for a Hausa trader etc.

Third was the mapping out of the layout of each of the selected houses in order to translate the buildings into the syntactic language necessary for their spatial configuration analysis and to establish the quantitative dimensions of space at the quotidian level, that is at the intimate level of everyday living. This entailed a determination of the sizes of functional spaces, their distribution, uses as well as defining the space[99] by the nomenclature used to identify them by the occupants of the house. Simple architectural plans and sections were then drawn at either scale 1:100 or 1:200.

Fourth, was the mapping out the quotidian use of space. There are two possible ways of doing this; direct observation of the inhabitants of the houses or enquiring from them as to their use of space. For practical and expedient purposes recourse had to be made to the latter by means of a questionnaire administered to the adult inhabitants of every house; in each case a male and a female (**Appendices 4 & 5**). The most common activity patterns were considered. These were religious, educational, physical health, personal appearance, household maintenance, activities to do with nutrition, economic, recreation, social contact, sleeping and procreation . Four main activities deemed important and appropriate (infra **§ 10.5.1**), namely reception, living, eating and sleeping were inquired upon. The result was then collated to give the mean of responses by adult males and females.

Fifth, is investigating the conception of space at the group and individual levels especially as it relates to the social . The objective here was to establish to what extent the inhabitants identify and relate to their houses and the immediate environment. Again for practical and expedient purposes recourse has to be made to a questionnaire administered to the adult inhabitants of each and every house (**Appendices 4 & 5**).

Finally the physical characteristics of space was recorded in an attempt to appreciate spatial qualities at the local and global levels of the Old Kano City environment. This was done mainly by observation and asking questions while administering the questionnaires (**Appendix 3**).

4.3.2 Fieldwork

The only way to obtain most of the information necessary for the successful conduct of this work as set out above was to undertake fieldwork. This is the first time to the best of our knowledge that a work of this nature dealing exclusively with the Hausa domestic architecture has been undertaken. To be sure there have been many research works that dealt with some aspect or other

99. Hausa domestic space designation or labeling , like most African space labeling and unlike western domestic space, does not rigidly identify spaces with functions. Eg the word *ɗaki* usually interpreted as bedroom could in reality rarely beused for sleeping. See Bourdier JP & Minh-Ha T (1985:30-31).

of the Hausa society as exemplified by the Kano milieu, but the takeoff point of this work is the domestic architecture of the Hausa rather than planning, anthropology, sociology, geography, economics or political science, although of necessity this work touches on some aspects of these.

Next, the parameters for research set out above are also new. Thus certain information about the houses vital to this study had to be obtained first hand. For example there is no record of the architectural layouts of the Kano ordinary houses extant or extinct. The few available are almost invariably the houses of elites and the nobility, like the ones recorded by Foyle and Dmochowski referred to above (1951-52 &1990 respectively).

The fieldwork lasted 14 weeks, from the beginning of June 1994 to early September 1994. Again because of the time limitation, the scope of the task and the social milieu in which it was conducted, it became necessary to procure the assistance of certain personnel. For example because wife seclusion or *kulle* [100] is still strong in many parts of the Old City it became necessary to recruit female assistants who could have access to those places where males are denied access.

In all 15 students of the Kano State Polytechnic, School of Architecture and Art were recruited as assistants (**Appendix 21**). These were given basic training on measuring, drawing and questionnaire administration over a two week period . A full day exercise was conducted to test the reliability of the method of measurement, the ease of the administration of the questionnaire and the best time frame for the conduct of the field work.

In conducting the fieldwork it became necessary to work closely with the respective *MaiUnguwa* or administrative head of each ward. There were usually three visits to the ward. On the first run, reconnaissance was conducted around the ward with the *MaiUnguwa* in order to see its extent and verify that the general area identified from the map corresponds to the actual ward on the ground.

On the second run efforts were made to confirm that the houses selected from the map were still extant. Where this is not so or where such a selection was deemed not representative of the general outlook of the ward new selections are made. This was done by dividing the ward into four sectors and selecting houses from each sector. In some cases the ward had clear identifiable lanes which were then used to select houses across the ward. However sometimes houses that were well known in the ward, i.e. associated with a famous clan head were selected. Thereafter a date was set in concert with the *MaiUnguwa* , not less than three days ahead, for recording the data on the house. The *MaiUnguwa* was then expected to inform the *Maigida* or head of the house, and obtain his or, in rare cases, her consent .

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[100] *Kulle* is the social segregation of males from females also known in the Middle East and Far East as purdah. See infra chapter 4 for a full discussion of this practice.

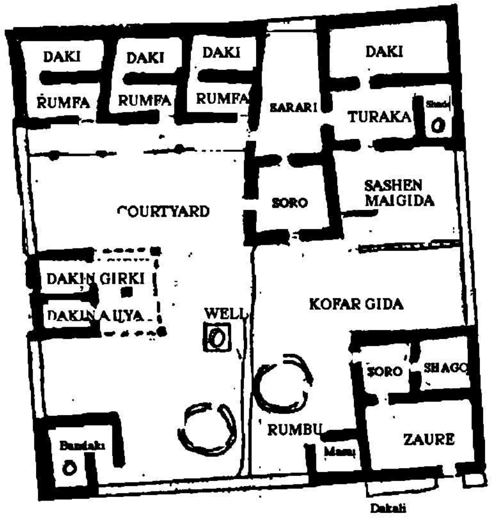
On the final run, the group arrived on the agreed date at the appointed time. The *MaiUnguwa* then introduced each team of investigators, usually two males and a female, to the *Maigida* . If he had no objection then while one male assistant administers the questionnaire to him one other male assistant takes the measurement of the house. Meanwhile the female member of the group administers the questionnaire to the *Uwargida* or the senior female in the house, usually the wife . If the *Maigida* objected to a male entering his house then one of the females trained in measuring and recording the dimensions of the house was called to do that. Finally a photograph of the exterior of the building was taken.

4.3.3 Limitations

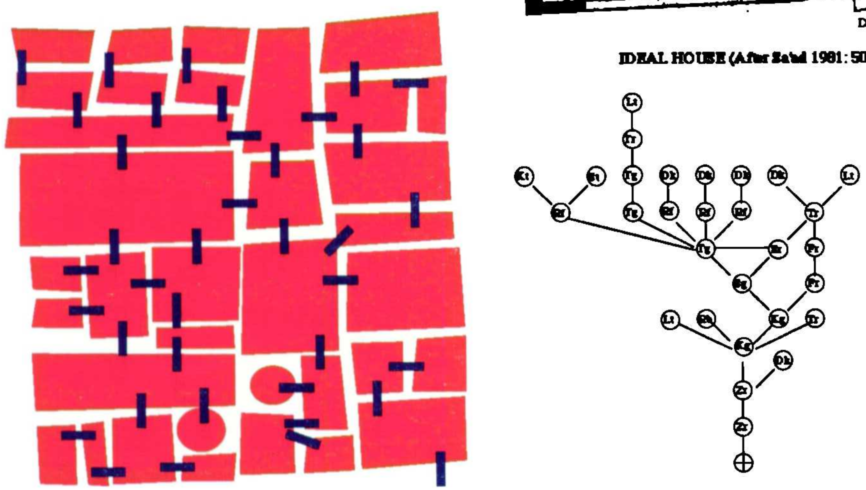
While conducting the fieldwork certain problems were faced which limited the extent to which the plan of action as enunciated in the field work proposal, could be carried out. These constituted limitations on the work, and the most important ones are presented herewith. First in selecting the houses on the ground it became necessary to select more houses than one could possibly cover in order to account for the unforeseen. For instance not all the *Masu gida* (plural of *Maigida*) were willing to be interviewed let alone allow their houses to be measured. Some house heads while allowing themselves to be questioned could not hear of their wives, sisters or mothers being interviewed. Some house heads simply kept away from the ward on the appointed day[101]. Their reasons for avoiding the interview were many and varied, ranging from fear of the unknown to the suspicion that the group is some government agent up to no good. In such cases we had to fall back on those available and willing to allow us into their houses even though in some cases their houses were not chosen in the first round of the process.

Second, to measure the houses it became necessary to use the estimation method; that is the dimensions of the rooms and other defined spaces were estimated. This is because as mentioned above, not all *Masugida* allowed the group the time needed to make accurate measurements. While some went away and left us by ourselves quite a few hovered suspiciously over the group and indeed hurried us about and out . However, to check on the efficacy of this method ten houses were selected and measured, first by estimation, and then more accurately using field tape. The difference between the two measurements was computed (**Appendix 9**). The

[101] In one curious and funny though sad case, the house head packed his entire family and travelled to the country side a day before the appointed date and did not return until 10 days later, well after we have completed work in the area.

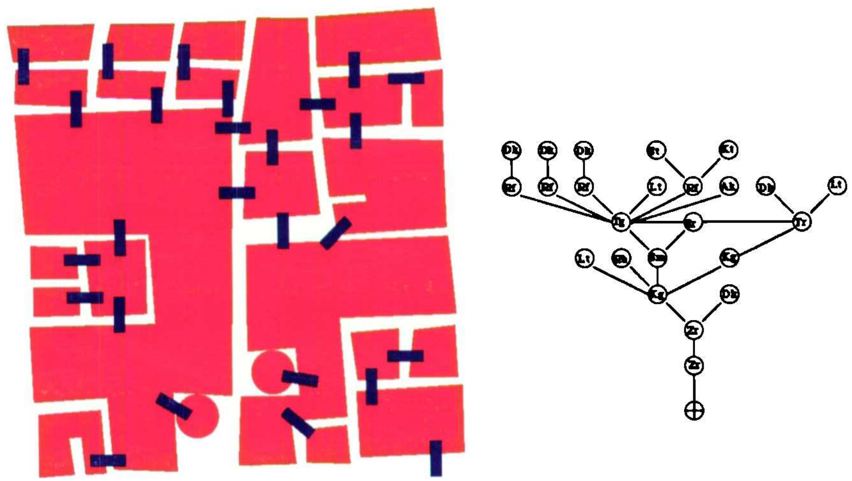


IDEAL HOUSE (After Sa'ad 1981: 50)



IDEAL HOUSE CONVEX SPACE BREAK-UP

In Convex break-up spaces are delineated to conform to the strict definition of space convexity vide Hillier & Hanson (1984: 98 & 150)



IDEAL HOUSE CONVEX *FUNCTIONAL* -SPACE BREAK-UP

Convex space break-up is determined by the fuctionality of space. i.e., space convexity is made coterimnus with space function

FIGURE 4.3 : CONVEX FUNCTIONIONAL SPACE DEFINITION

The Percentage Error [102] in the estimated measure ranged mainly between plus or minus 5 to 10 % [103]. This was deemed an acceptable field measurement.

Third, the concept of convex space used here differs from that used by Hillier et. al. (1987). The strict definition of convex space (1984:97) is not used . Rather every functional space is regarded as a convex space. For example a courtyard is considered as a single convex space on the justified graph, even though it is made up of several convex spaces. Also where an ordinarily defined convex space has more than a single clearly defined function, then the number of such clearly defined functional areas are considered as spatial nodes in drawing up the justified graph. For example a courtyard with part of it clearly designated as a *murhu* or hearth and used so, is considered as two spatial nodes on the justified graph. This is because functional spaces are considered as socially more meaningful than simple convex spaces (**Figure 4. 3**) . The result is a different set of mathematical values, which probably capture the essence of the spatial configurational properties more accurately.

Fourth, given the nature and limitations of this work it was not practical to indulge fully in actually observing the quotidian use of space, although notice was made of who was met where. Ultimately one had to rely on the responses of the inhabitants to the questionnaire.

Finally, some problem of language were encountered. For example in answering as simple a question as, the number of families in the house, one had not so easy a time. For example, in the Hausa language, the language in which the questions were asked, there is one word, *magidanta* , that is used for family but with different connotations; in one sense it could mean a married person, i.e. a family man, though not necessarily a person who supports his family. In another sense it could mean a person with wife and children who *supports himself*. So to the question, " How many families are there in this house ?" {*Magidanta / Masu iyali nawa ne a gidan nan ?* }, some will respond with the number of married men irrespective of the fact that some have no children or that their wives are not co-resident, while others will respond with the number of only those who are independent and thus discount their children who are married and with children of their own but who do not support themselves. Thus one has to be very careful in stating questions and in recording the answers.

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[102]The % Error in measured dimensions is given by, $E_x = \frac{X_m - X_e}{X_m} \times 100$ Where X_m and X_e are the measured and the estimated dimensions respectively. Note that absolute values were used in the computations.

[103] To be precise , cumulatively about 45 % of the estimated dimensions (length and breadth) were under the plus/minus 5% error range, while over 82 % were in the plus/ minus 10% range. For the area (based on the estimated dimensions), 61.5 % were under the plus/minus 5% error range, while cumulatively 88 % were in the plus/ minus 10% range. A more graphic but perhaps less accurate way of showing this is to regress the measured dimension(X_m) against the estimated dimension (X_e). The R^2 values got this way are , 0.990; 0.964; 0.997 for the length,the width and the area respectively.

4.3.4 Process of Analysis

For each of the wards from the four sectors, the data collected is analysed under the following sub-headings; Physical Properties; Spatial Configuration; Activity-space Utilisation; Space Provision; Space Allocation and Space Differentiation.

In order to facilitate the analysis of the collected data, it becomes necessary to categorise the spaces found in the houses into discreet units. From the description given above of the Hausa house (Chapter 3), broadly speaking the Hausa house has three parts; *ƙofar gida*, *tsakar gida* and *ƙurya*, each comprising of functionally and or, socially differentiated spaces. These space types could be grouped, broadly into five clear categories ;

A : the entrance hall or *zaure* (also called *soro* , *shigifa*, and *kudandan*) which includes the *farfajiya* and the *dakali*.

B : the *ƙofar gida* (also called *sarari*) or the outer yard which includes the *turaka* and the outer room and sometimes or *shago*

C : the *tsakar gida* or central courtyard which includes any other open space the *sarari*, and service areas like the *murhu* or cooking place

D : the *rumfa* (also called *falo*) or inner hall

E: the *ɗaki* and the *shago* the inner and the outer rooms respectively.

X : the service spaces , that is the *banɗaki* or toilet, (also called *masai*, *shadda* etc.), *mawanka* or wash-up area and the *murhu* or cooking place (also called *kicin*, *madafi*, *ɗakin girki* etc.)

This grouping is used to order the syntactic values of the spatial configurations of, as well as map the activity-space pattern within, the selected houses.

In analysing the data collected two computer softwares developed by the Unit of Architectural Studies (UAS) of the Bartlett School of Architecture, University College London (UCL), were used for the urban configuration of Old Kano City and for the domestic spaces. To analyse the urban pattern of Old Kano City maps of the city in scale 1: 20,000 were used. From these axial maps of the city were abstracted and scanned. These were then traced using **MacDrawPro** software and then processed using **Axman.**

For the spatial configuration of the houses, the convex space break up was first carried out and the justified graphs were drawn . From these the spaces were designated both by number and by name. The numbers were then used as input to the computer programme called **New Wave** which processes the spatial configuration. Thereafter two main statistical programmes,

Statview +512 or **Statview 4 (FPU)** were used to transform the results into syntactically meaningful terms; i.e. RRA, depth and control.

The RRA values are reciprocated to give integration values in descending order , i.e. integrated spaces have high numerical values, while the segregated spaces have lower numerical values. Thus for instance if a system with five spaces has integration values 0.73, 0.45, 0.92, 0.61, and 0.84, then the space with 0.92 is the most integrated while the space with 0.45 is the most segregated.

The integration values of every space in each house are presented in two tables ranged in descending order of integration. The first table, shows what we may term the First Integration Order or INTORD I, that is, the integration values of the spaces when the exterior of the house is considered as part of the system . The second table, shows what we may term the Second Integration Order or INTORD II, the integration values of the spaces when the exterior of the house is discounted from the system.

Finally, the *integration core,* INTCO, that is, the relationship between depth and integration of each house, is plotted by shading the 33% most integrated spaces black and hatching the 33% most segregated spaces.

4.4. Assumptions

In carrying out the research certain assumptions were made about the Hausa socio-cultural milieu , the city of Kano and its architecture. First, the Kano socio-cultural milieu is both homogeneous and heterogeneous; at the global level some strong cultural parameters are common to all inhabitants e.g., religion , language and *genre de vie* . At the local level however certain cultural traits are peculiar e.g., group identity and status .

Second , the spatial growth of Kano follows a certain historical continuity[104] , as such the older units or wards of the city are more likely to house the descendants of the more indigenous Kano people. Some earlier studies of Kano (Paden 1973; Perchonock 1976) seem to indicate this .

Third, Kano city wards are more than just administrative units; they are units of social and economic significance and the strong social ties within and across wards (supra **3.2**) suggests some relationship between their boundaries and the " ... original settlement pattern" (Perchonock 1976:5).

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[104] The major sources of Kano history all agree that the spatial growth of the city was North to South and East to West. See Palmer (1928) & Dokaji (1978). For a contemporary study of the spatial growth of Kano see Frishman (1977).

Fourth, colonialism has been the major cause directly or indirectly of the major changes in the architecture of Kano in particular, and Hausaland in general[105] . However these changes are reflected more in the appearance rather than in the configuration of spaces of most of the Kano domestic architecture[106] . This is not to say that there were no changes in the form of Hausa architecture or that the changes are not substantial but by and large these changes were superficial or dimensional rather than morphological. One of the major findings of the research that follows is that house appearance changes but configuration is *mutatis- mutandis* constant .

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105 For a discussion of the effect of colonialism on Hausa architecture see Sa'ad 1985.

106 Although there is no study made in this respect yet some other studies on Hausa architecture tend to support this assumption . See for example Schwertdteger 1982 & Moughtin 1985 .

PART TWO: *KUFAI ZUBABBE* {ABANDONED RUINS}

Inna ratsa kufai zubabbe
Sai na kan tuna yau da gobe
Da mutane tai wa zobe
Yau wuƙar-sarki da babe
Ya cika shi da ƙonsanal maharba

Ba a nesa ba ga Maƙera
Babu kowa sai fa kura
Sai karanɓuki shi ka ƙara
Sai fa jan-ɓelɓel da tsara
Tamkar basu tara 'yan Adam ba

Da garin sai masu iko
Yanzu ba ko masu tarko
Sai fa rimaye da ɓakko
Soba mai son nuna fiko
Ba ka sami yasu a mallaka ba.

Dandalinsu na cin abinci
Babu kowa sai kumurci
Ɗakunansu dila ka barci
Da tana da riƙon aminci
Da Jan-Gwarzo bai mace ba

(***Waƙar Imfiraji II*** *vv 64 - 67* AA Namangi 1962)

When I come across abandoned ruins
I get to contemplating upon life
And communities (the world) has forsaken
Now only pests and vermin
And hunters droppings abound therein

Not far off, behold (the ruins of) Makera
None dwells therein save the hyena
And the lone wolf a-howling
Save also the bat and its kin
As if humans never lived therein

The town in the past, full of nobles and commanders
Now not even tramps or loafers
But (shadeless trees) Kapoks and Baobab
Dear friend, given to boasting
You have attained to their glory not

Their town centre, the focus of all activity
Empty ! Except for the poisonous snake
Foxes (wily) inhabit their rooms
If Death does a promise keep
(Bawa) The great, would never have died

CHAPTER FIVE : DATA PRESENTATION

5.1 General

Given the nature and urban disposition of the city of Kano, the sample of the houses surveyed is a mixture of some sorts. Physically the houses range from the very small accommodating a single family to the extremely large multi-family dwelling with not a quite a few unrelated persons ; socially from the humble dwelling to the house of the nouveau-riche, and from the very old to the most recently constructed. There are several ways possible of sorting and ordering the houses. The simplest and the most obvious would be their geographical location, that is the respective city sectors and the wards. This however, has two draw backs. First, the number of houses surveyed from each ward, with four exceptions, is 5 houses, making it too low to be statistically significant. At any rate there is little that perceptibly differentiates one ward from the other. Secondly, as noted above the division of the city into sectors is purely administrative and has no social or economic significance. For this the geographical ordering is discarded.

The sample of the houses surveyed could also be classified using the social status of the occupants and the number and size of sleeping rooms. The basic premise of the study rules out the former, i.e., social status since it is principally concerned with the ordinary houses of the Hausa rather than those of the very rich or the nobility. The number of rooms, the most common means of classifying house samples (e.g. Schwerdtfeger 1982), could have been used but for two reasons. First the investigation of the spatial relationship through configurational analysis, an important aspect of this study, would be severely restricted and even meaningless if the spatial analysis intended is restricted to the sleeping rooms alone. Secondly, and perhaps more significantly, the number of rooms in a Hausa house, as we shall see is not the only socially and or functionally, significant space even though ideally the number of rooms in a house may be strongly related to the number of adults in that house (supra **3.5**). Thus it is possible to find a house with a single room and two or more *zaure* or entrance halls (See infra **House 8** for instance).

It is for these reasons that the number of convex-functional spaces (K-spaces) in a house would be used in ordering the houses. However K-spaces only account for the physical aspects and there is need also to account for the social aspect of the of the house which is considered even important. The number of families accommodated in a house, is therefore used as a primary means of ordering while the number of K-spaces is used as secondary means.

The total number of houses surveyed is 160, 101 (63 %) of which are single family houses. The remaining range from those with 2 up to those with 8 families, except three which have no family, but accommodate single men (**Table 5.1**). Syntactically the sizes of the houses range from a minimum of 6 to 98 K-spaces with the majority of the houses in the 11-15 K-spaces brackets

(**Table 5.2**). Most of the houses exhibit tree like justified graphs, but 27 houses or just over 16% have rings which are mainly external.

TABLE 5.1 : FAMILY DISTRIBUTION IN SURVEYED HOUSES

FAMILY SIZE	0	1	2	3	4	5 -7	8
FREQUENCY	3	100	31	8	9	4	5

TABLE 5.2: K-SPACE FREQUENCY DISTRIBUTION IN SURVEYED HOUSES

K- SPACES	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	≥ 46
HOUSES	30	56	36	14	8	5	1	6	4

For the purpose of presentation the 160 houses are arranged in ascending order, first by the number of families accommodated and secondly by the number of K-spaces. In every category houses with tree-like justified graphs are presented before those with rings if any. Taken this way, each house is given a presentation number from 1 -160.

As noted earlier (supra 4.3.4), the various functional spaces are categorised, for the purposes of analysis, into 6 main spaces as follows;

A : the entrance hall or *zaure* (also called *soro* , *shigifa,* and *kudandan)* which includes the *shago* and in isolated cases the outer open seating areas the *farfajiya* and the *dakali.*

B : the *ƙofar gida* (also called *sarari*) or the outer yard which includes the *turaka* (the house head private room.

C : the *tsakar gida* or central courtyard which includes any other open space the *sarari,* and service areas like the *murhu* or cooking place

D : the *rumfa* (also called *falo*) or inner hall and the *kwatashe* or veranda.

E: the *ɗaki* and the *shago,* the inner and the outer rooms respectively.

X : the service spaces , that is the *banɗaki* or toilet, (also called *masai, shadda* etc.), *mawanka* or wash-up area , the *murhu* or cooking place (also called *kicin, madafi, ɗakin girki* etc.), the store and the garage .

The same designation is also used for presenting the houses. In addition the six basic spaces are colour coded to facilitate easy visual appreciation of the respective space types in each house.

Finally, the presentation number of each house is used to locate its position in the walled city on the inset map. The houses are hereunder presented.

5.2 Zero Family < 20 K-spaces

Three houses out of the surveyed houses do not accommodate any family. (**Figure 5.1**). Two of these accommodate 3 youths each, who usually spend most of the day at school or working as errand boys. The third house (**House 3**) belongs to a widower who has remained single, a socially unusual thing, given the size of the house and the fact that the owner is well-off. This house is spatially different from the others in that it is the only house with a *kofar gida* (outer yard). **House 1** is the only single story house in this group. Syntactically the three houses are very much similar in that they all exhibit tree-like justified graphs with a depth (from outside) of between 5 & 6.

5.3 Single Family Houses

As noted above the bulk of the houses surveyed, fall into this category. Of the 100 houses in this category, 18 houses have justified graphs that exhibit rings. The 82 single family houses that exhibit no rings in their justified graphs are ordered into 5 sub-groups (**Tables 5.3)**. The details of each sub-group is as follows.

TABLE 5.3: ONE FAMILY HOUSE (NON-RINGY{NR}) K-SPACE DISTRIBUTION

No. OF K- SPACES	6-10	11-15	16-20	21-25	≥ 30
FREQUENCY	22	35	16	6	3

5.3.1 Single Family Houses (NR)

5.3.1.1 Single Family Houses (NR), < 10 K Spaces.

There are 22 houses in this category. They are numbered 4 -25 and presented in **Figure 5.2 (a - e)**. Their respective locations in the city are as indicated on the inset diagram . The houses are without exception all single story, and not unexpectedly most belong to families in the low income group. In shape they vary , some rectangular others irregular, attesting to their mode of construction.

The mean number of persons per house is approximately 6, but most of the houses have a population of 4 or 5 persons. There is not a single house in this sub-group with a polygamous family. Not unexpectedly given the nature of Hausa society (Schildkrout 1972), children make up the bulk of the population here.

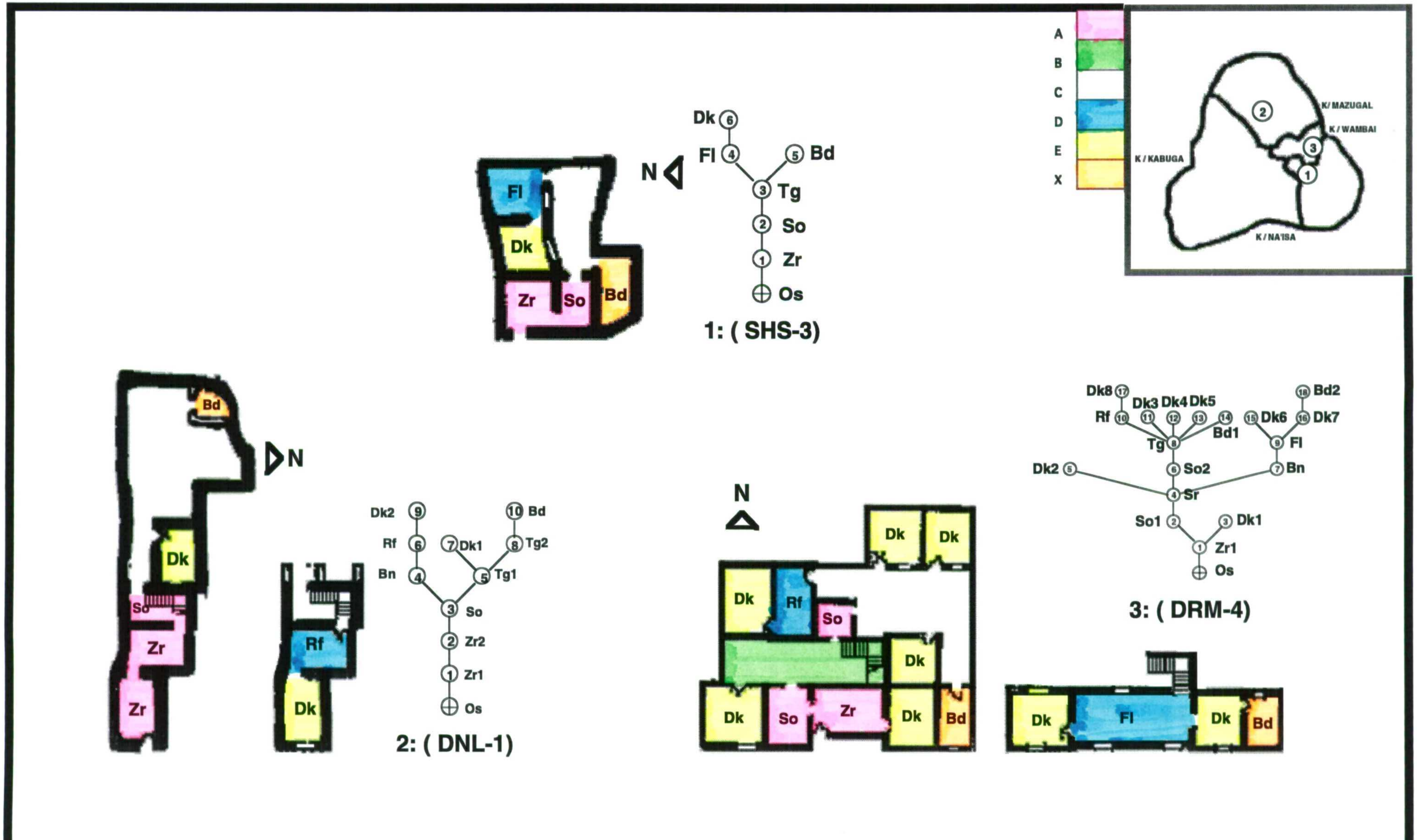

FIGURE 5. 1: ZERO FAMILY ; 6 - 20 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

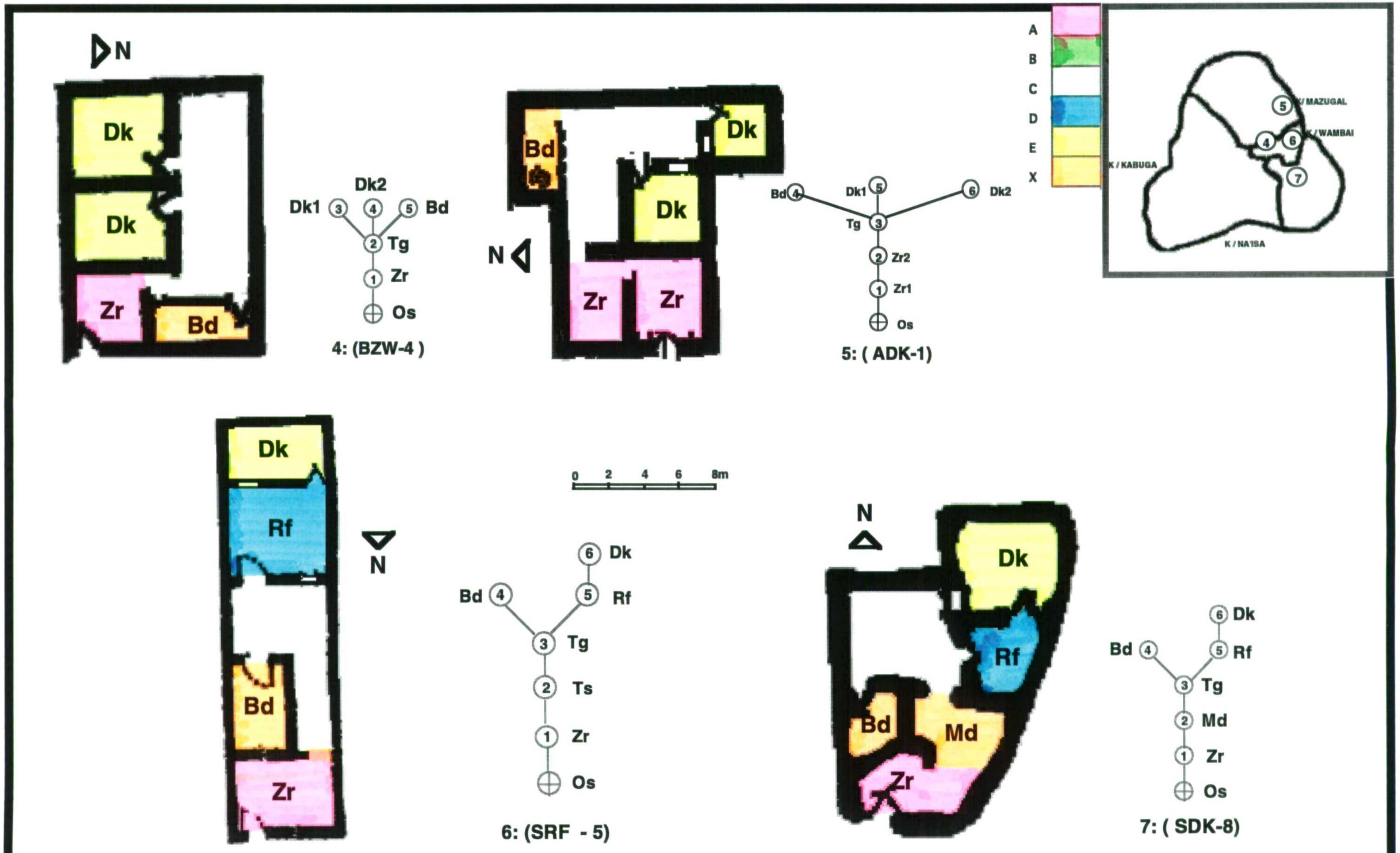

FIGURE 5.2a : SINGLE FAMILY ; < 10 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)   B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);   C : Tsakar gida (Tg); Sarari (Sr)   D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)   X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

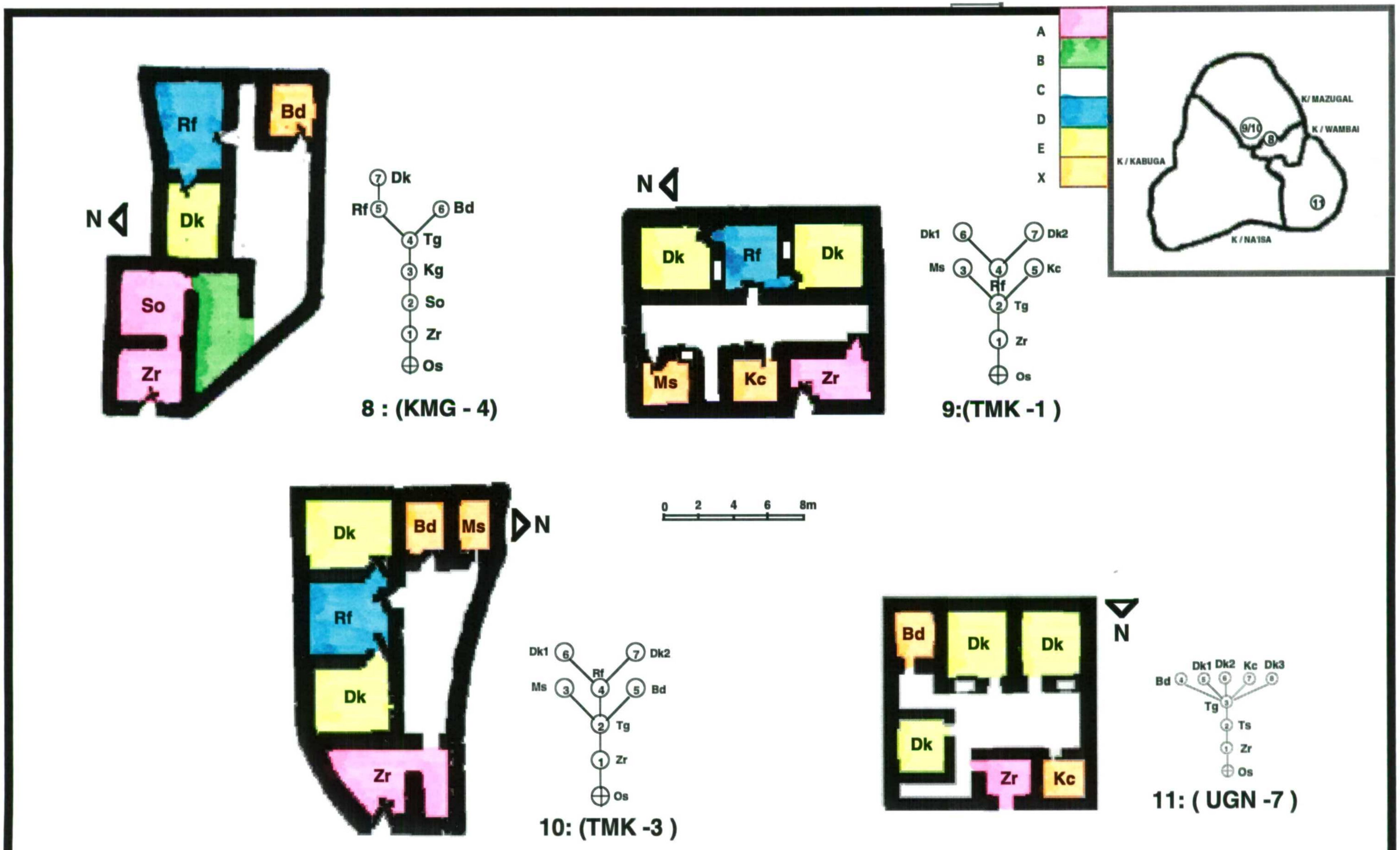

FIGURE 5.2b : SINGLE FAMILY ; <10 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

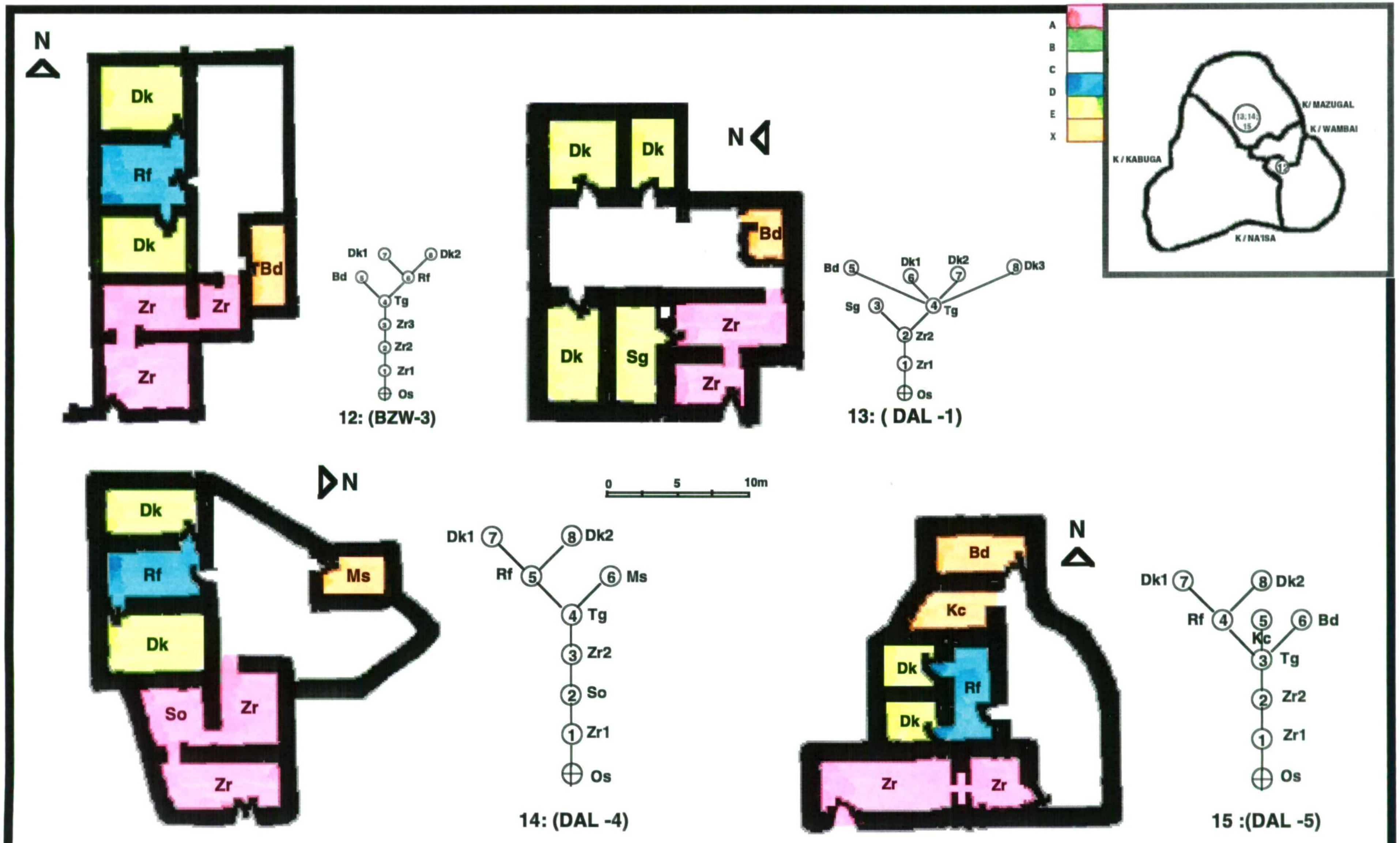

FIGURE 5. 2c : SINGLE FAMILY ; < 10 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

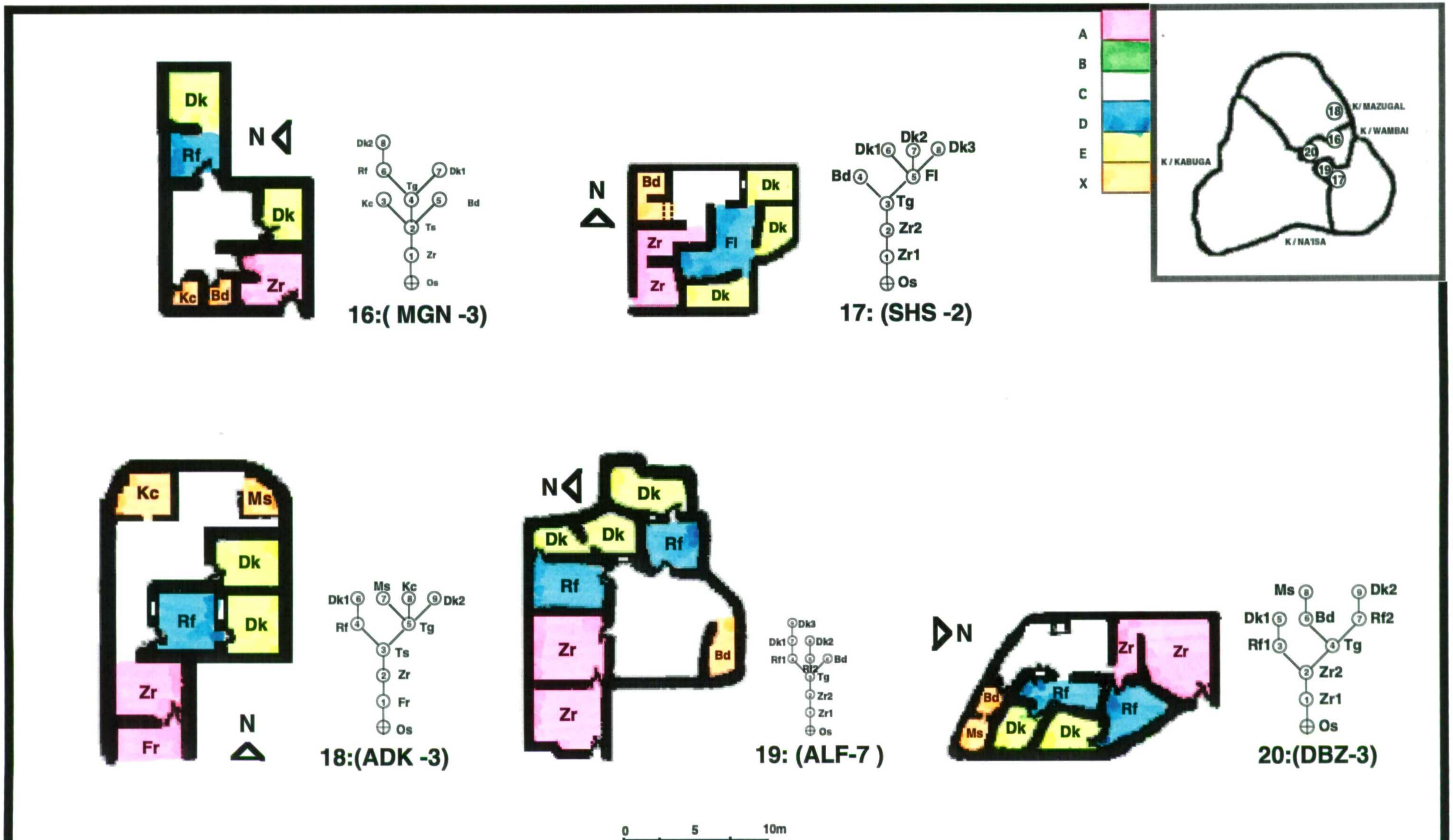

FIGURE 5.2d : SINGLE FAMILY ; < 10 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

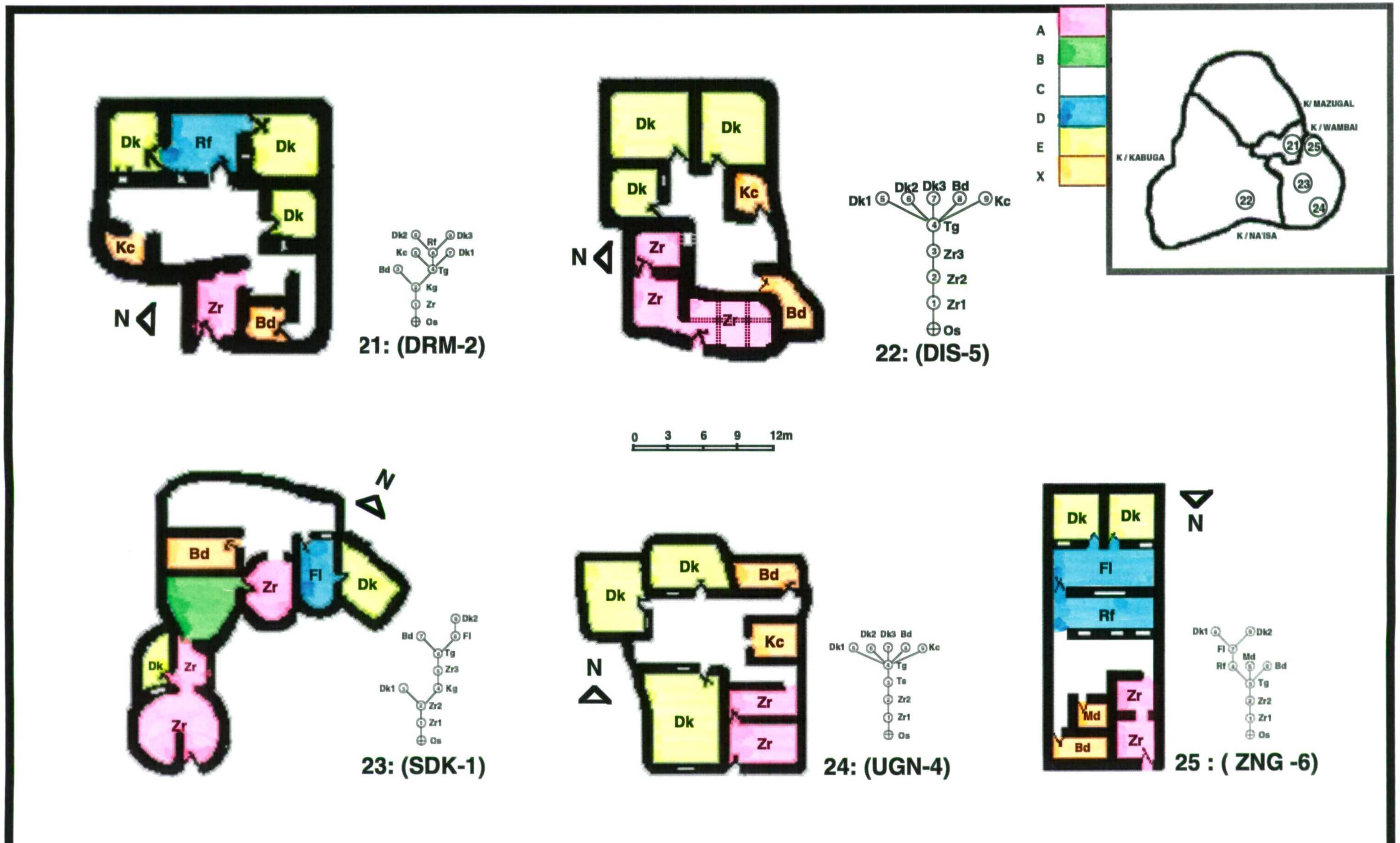

FIGURE 5.2 e : SINGLE FAMILY ; < 10 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl) B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg) X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

It was not possible to determine accurately the date of construction for most of them. However, as far as could be determined the oldest seems to be **House 23 (Figure 5.2e)**, which according to a reliable oral tradition was constructed circa 1810. The circular shape of its entrance hall gives credence to this tradition. The most recent is **House 6 (Figure 5.2a)** which was constructed in 1984.

Of particular interest is **House 11 (Figure 5.2b)** which was constructed by the defunct Native Authority (NA) in the 1950's. It was made as a prototype low cost house for its employees. Unfortunately the housing scheme was never realised. The interesting thing about it is that , it was designed by the colonial Power Works Department (PWD), which made an attempt, perhaps the first and the last, to make houses fit for the "natives" way of life.

Spatially the houses in this sub-group exhibit similar characteristics. The exceptions are Houses 4,5, 11, 13,22 &24 because they all lack *rumfa* (inner hall). **House 11** sticks out not only because of the size of its *zaure* (the entrance hall), but also because it has only one entrance hall . Of course **Houses 4** also has a single *zaure* (the entrance hall) but even so it is considerably larger than that of **House 11**. Another exception is **House 23**, for it is the only house with a *ƙofar gida* (outer yard) in the sub-group.

Syntactically all the houses have tree-like justified graphs with **Houses 11, 22** and **24** being bushy. Most of the houses are 5 steps deep from outside, but some are as deep as 7 steps.

5.3.1.2 Single Family Houses (NR), 11 - 15 K Spaces.

There are 35 Houses in this category (**Figure 5.3 { a - g }**) making it the largest sub-group. These are designated 26 - 60 , ten of which (approximately one third) are two storeys. Significantly almost half of the houses are located in the East sector of the city.

The mean population size is approximately 10 persons per house. Although like the previous sub-group most of the houses belong to the low income, yet about 34 % of the houses could be classified in the mid-income group. One interesting feature of this sub-groups is the presence of what may be termed the 'split' or 'fragmented' house . This is a house that used to be part of a larger house. It usually comes into being when a house is split among offspring as a result of inheritance but in rare cases as a result of purchase, that is part of a house is sold which is then modified into a new but invariably smaller house. Thus we note in **House 28** and **House 40** sealed doors in the first *zaure* or entrance hall, indicating that this space was once shared with the adjacent house. **House 34** and **House 53** are also 'split' houses although they have no apparent connection with the adjacent houses.

It was possible to determine the ages of only three of the houses with some certainty. These are **House 51, House 52** and **House 54** built in 1955, 1938 and 1970 respectively. In each case it

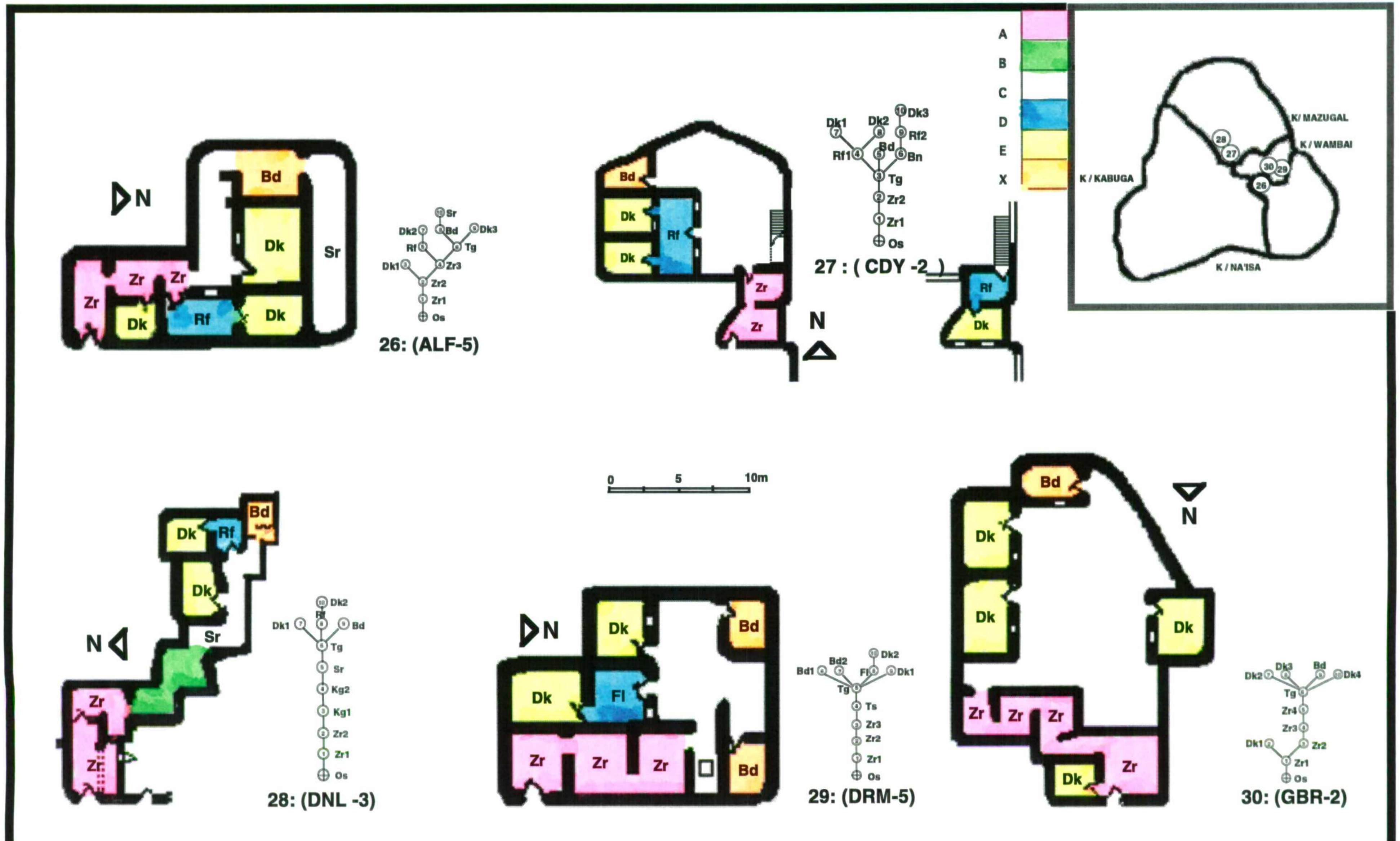

FIGURE 5.3a : SINGLE FAMILY ; 11-15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

E : Daki (Dk); Shago (Sg)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

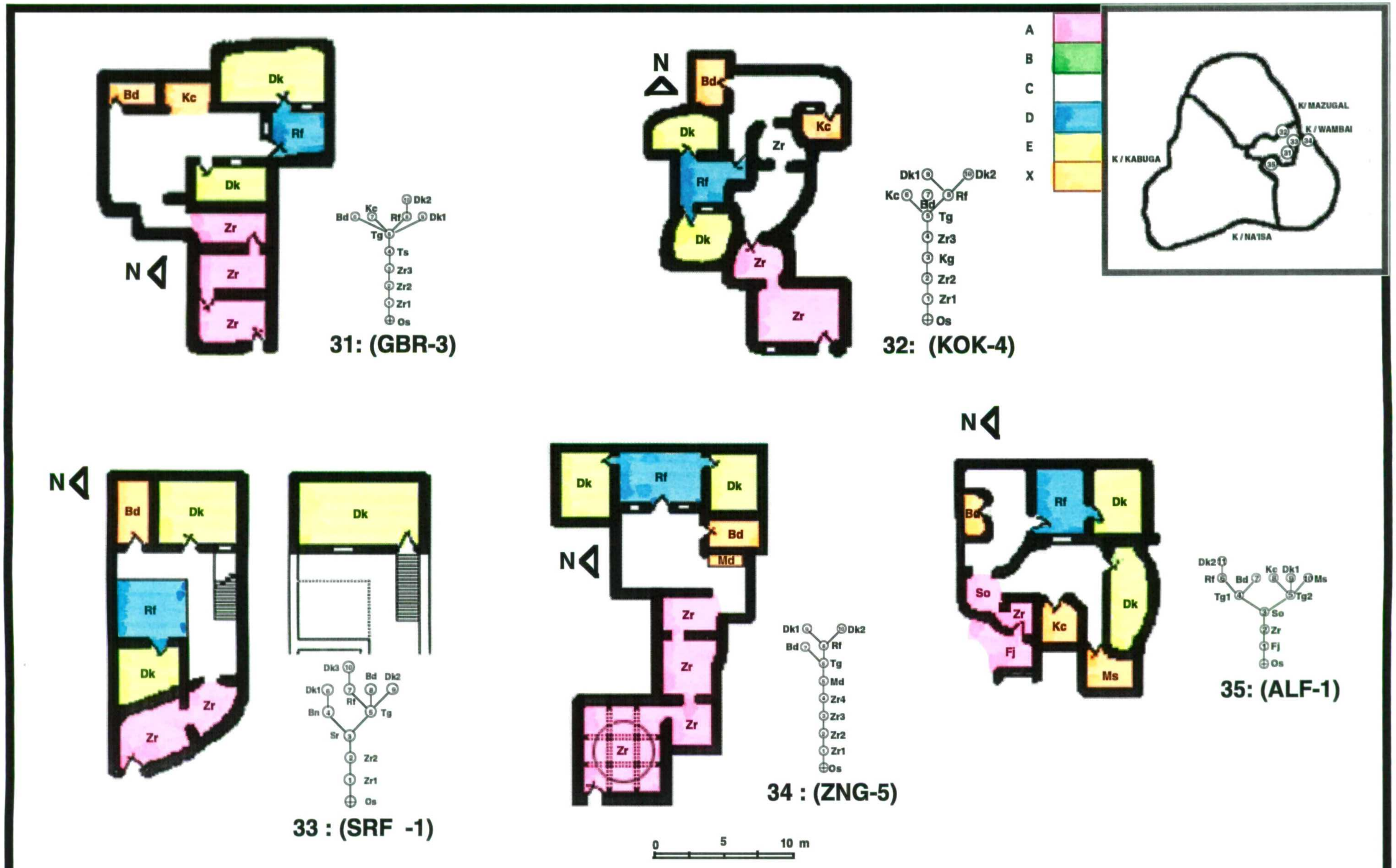

FIGURE 5.3b : SINGLE FAMILY ; 11 - 15 K-SPACES

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

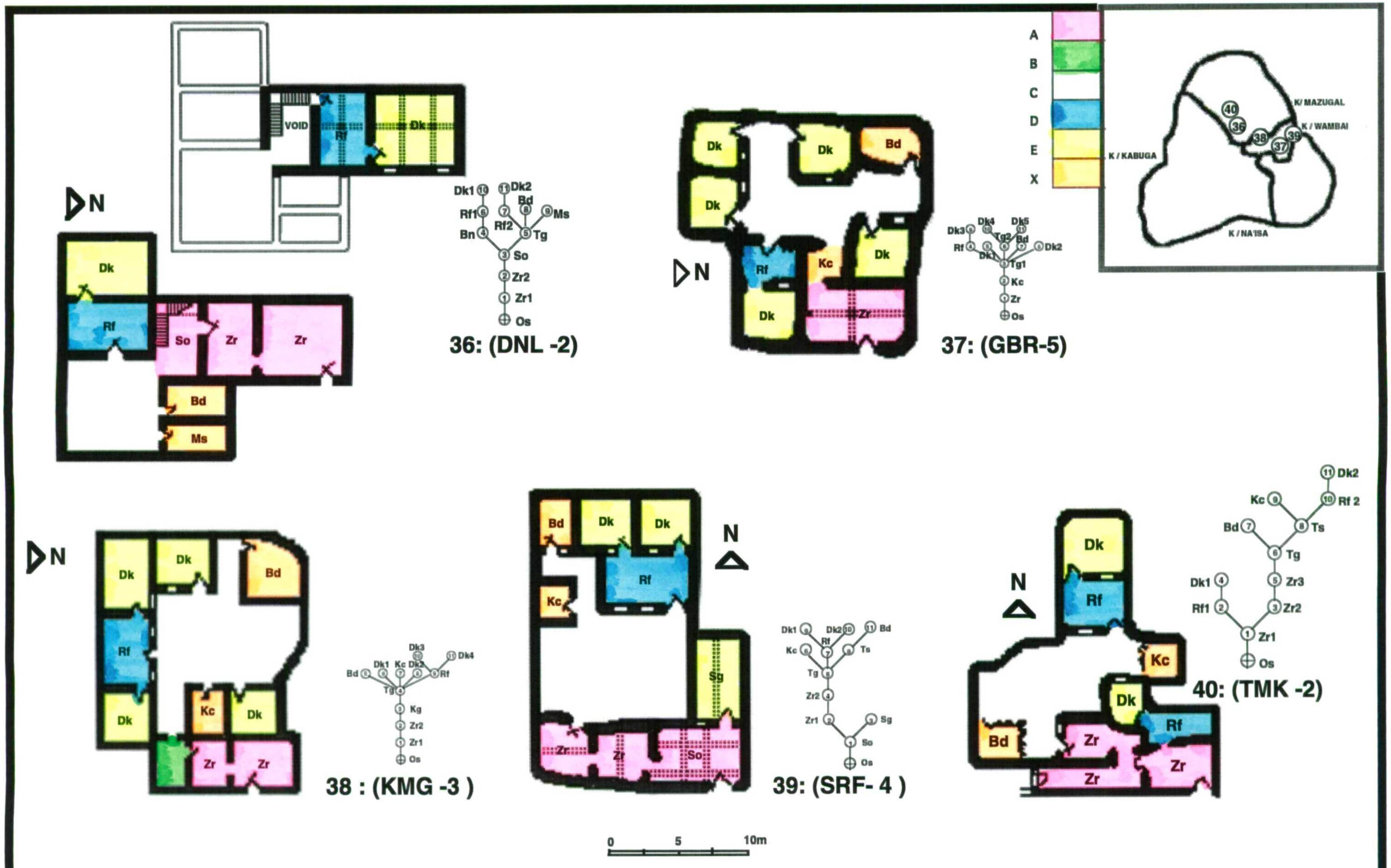

FIGURE 5.3c : SINGLE FAMILY; 11 - 15 K-SPACES

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

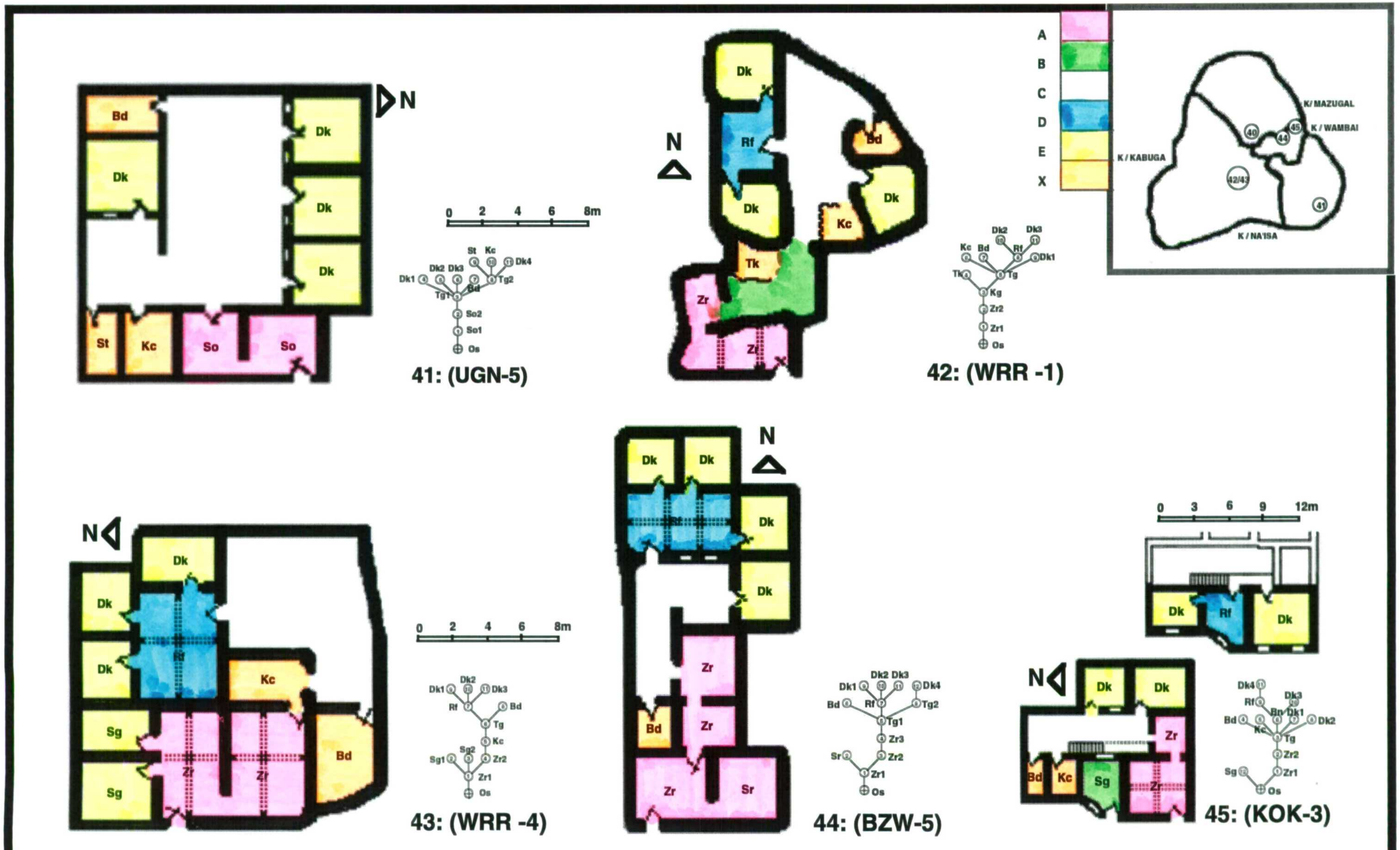

FIGURE 5.3d: SINGLE FAMILY ; 11 - 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

E : Daki (Dk); Shago (Sg)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

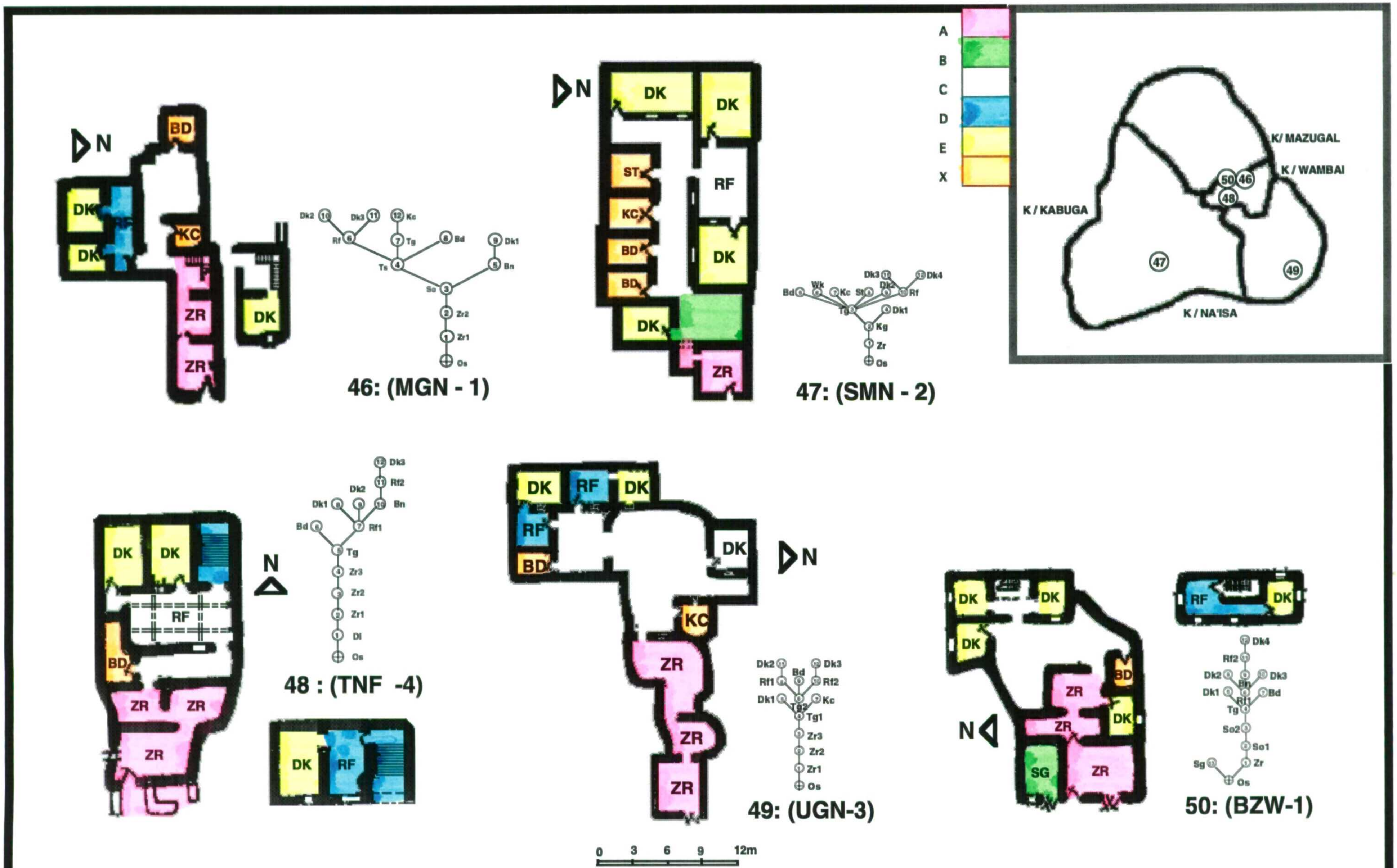

FIGURE 5.3e: SINGLE FAMILY ; 11 - 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl) B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg) X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

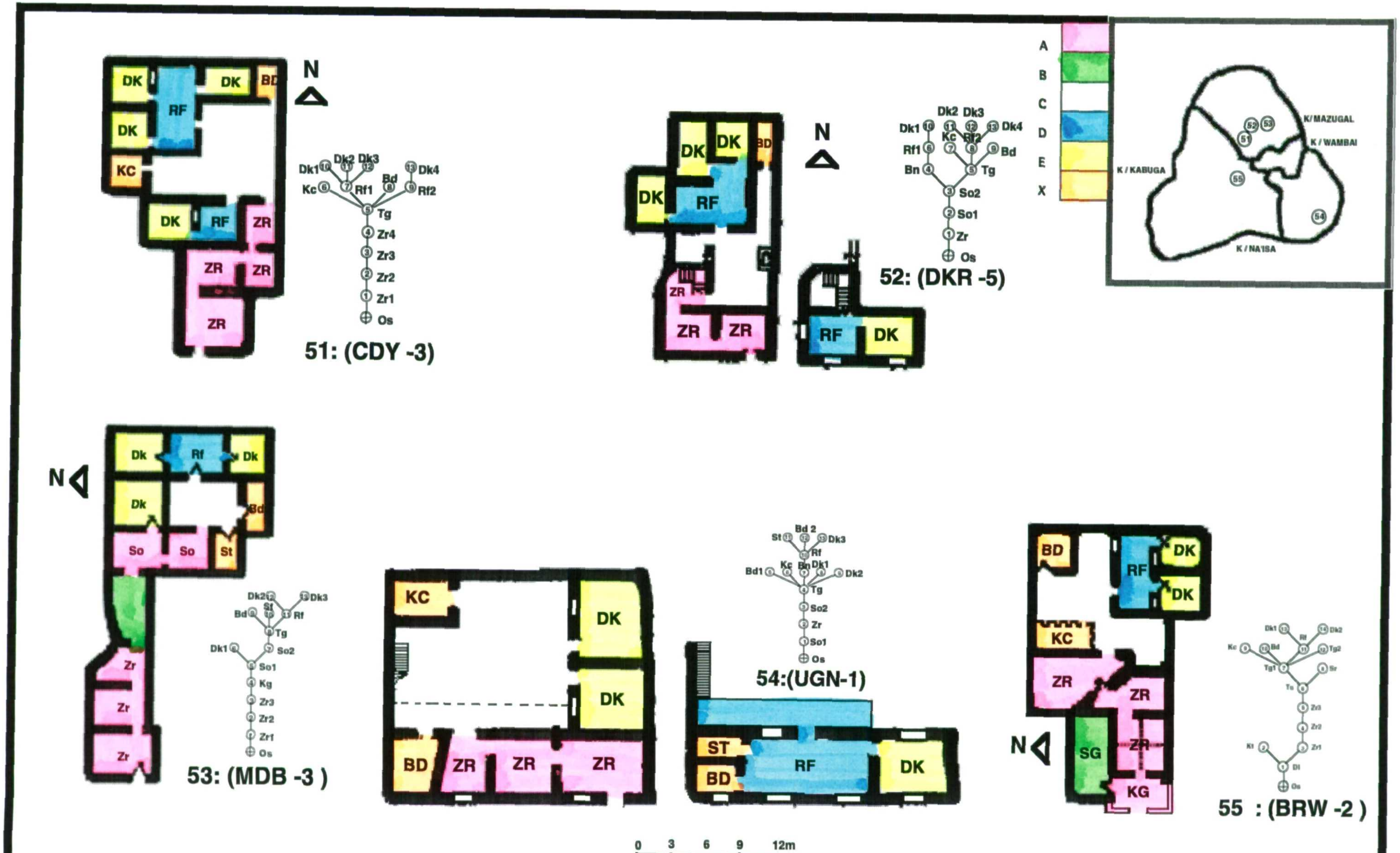

FIGURE 5.3f : SINGLE FAMILY ; 11 - 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

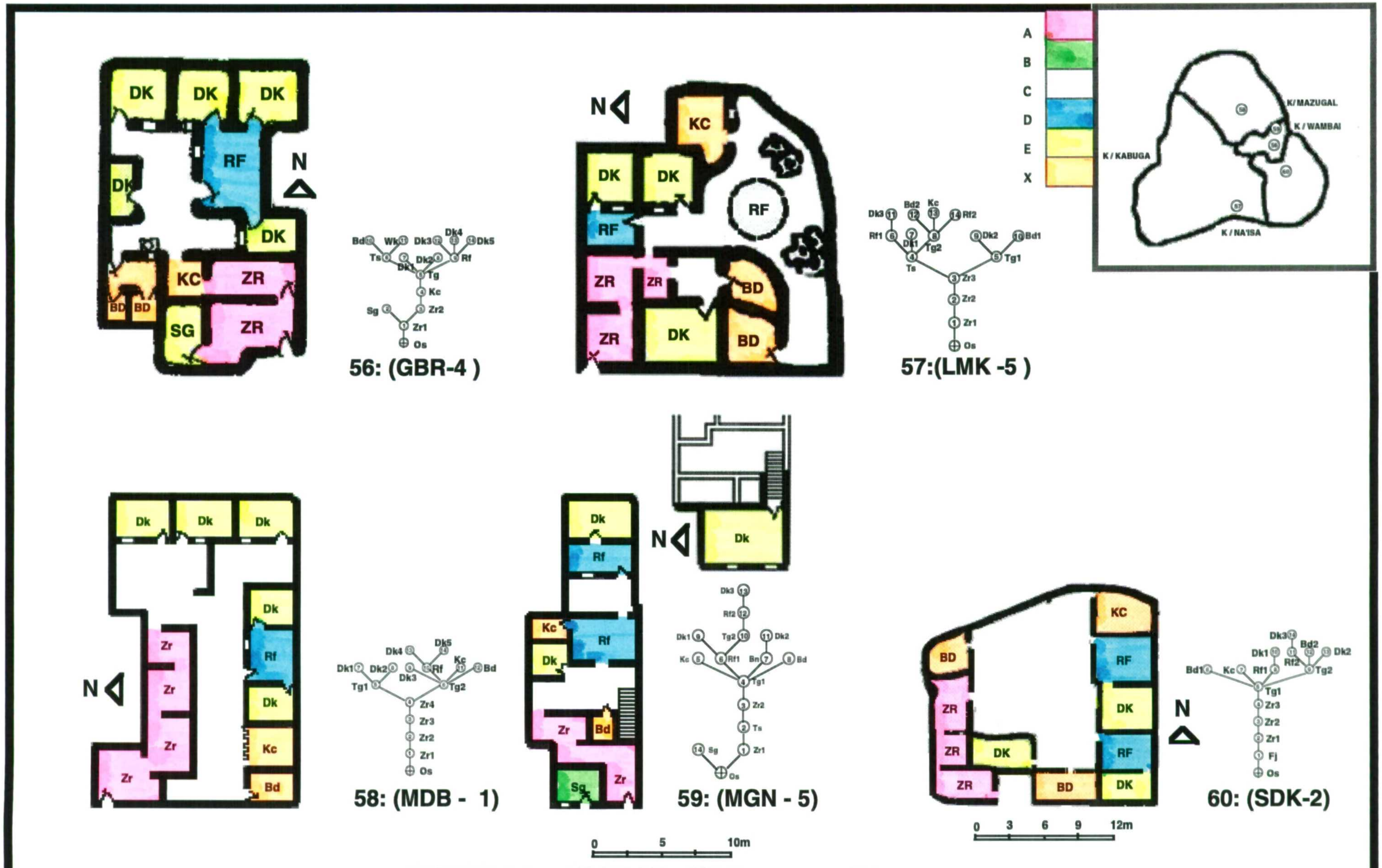

FIGURE 5.3g : SINGLE FAMILY ; 11 - 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl) B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg) X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

43, claimed to have been built at the turn of the century, is the oldest. This used to be the house of the Kano chief blacksmith. Its large and magnificent *zaure* gives credence to this. Although the craft is no more practised in the house, yet the main anvil is still in position and the position of the bellows is still discernible. Also of particular interest is **House 42**; this is the house of one of Jaggar's (1975) informants on blacksmithing in Kano, who still practices the craft.

Syntactically the houses are very similar in that they all exhibit tree-like justified graphs. Most of the houses are 6 or 7 steps deep from the outside, and in most cases the *tsakar gida* (inner courtyard is) at least 4 spaces deep from the exterior. In the 3 houses that have outer yard (**Houses 28, 32 & 53**), the courtyard is invariably deeper. This is another major difference between this and the previous sub-groups.

5.3.1.3 Single Family Houses (NR), 16 - 20 K Spaces.

This sub-group has population range of between 4 and 13 persons, with a mean of approximately 10 persons per house. Almost two-third of the 16 houses that make up this sub-group are two storeys (**Figure 5.4 {a - d }**)and although constructed of adobe, they are rectilinear in shape attesting to the influence of the colonial building construction tradition. The houses were mostly constructed in the last decade of the colonial period, that is 1950 -1960, but **Houses 63, 75** and **76** were constructed much earlier although their ages could not be accurately determined. **House 63** is apparently the oldest house in this sub-group, a fact not noticeable from the exterior. It has undergone many changes, for instance a new corrugated iron sheet roofing has been constructed over its original high *baka* vault construction.

In all but size this sub-group is very much similar to the preceding sub-group. Thus their justified graphs are all tree-like and most of the houses are at least 6 steps deep from the outside. Four houses (**66, 70, 72, & 73**), have outer yard (the *ƙofar gida*) again making the courtyard deeper with respect to the exterior.

5.3.1.4 Single Family Houses (NR), 21 - 25 K Spaces.

There are 6 houses in this sub-group. They are all two storey buildings (**Figure 5.5 a &b**) with a mean population of approximately 14 persons per house. **Houses 78 , 79** and **82** are partially constructed part concrete part adobe. **House 80** on the other hand is wholly constructed with concrete blocks. In shape therefore the houses are like those in the preceding sub-group, mainly rectilinear in shape .

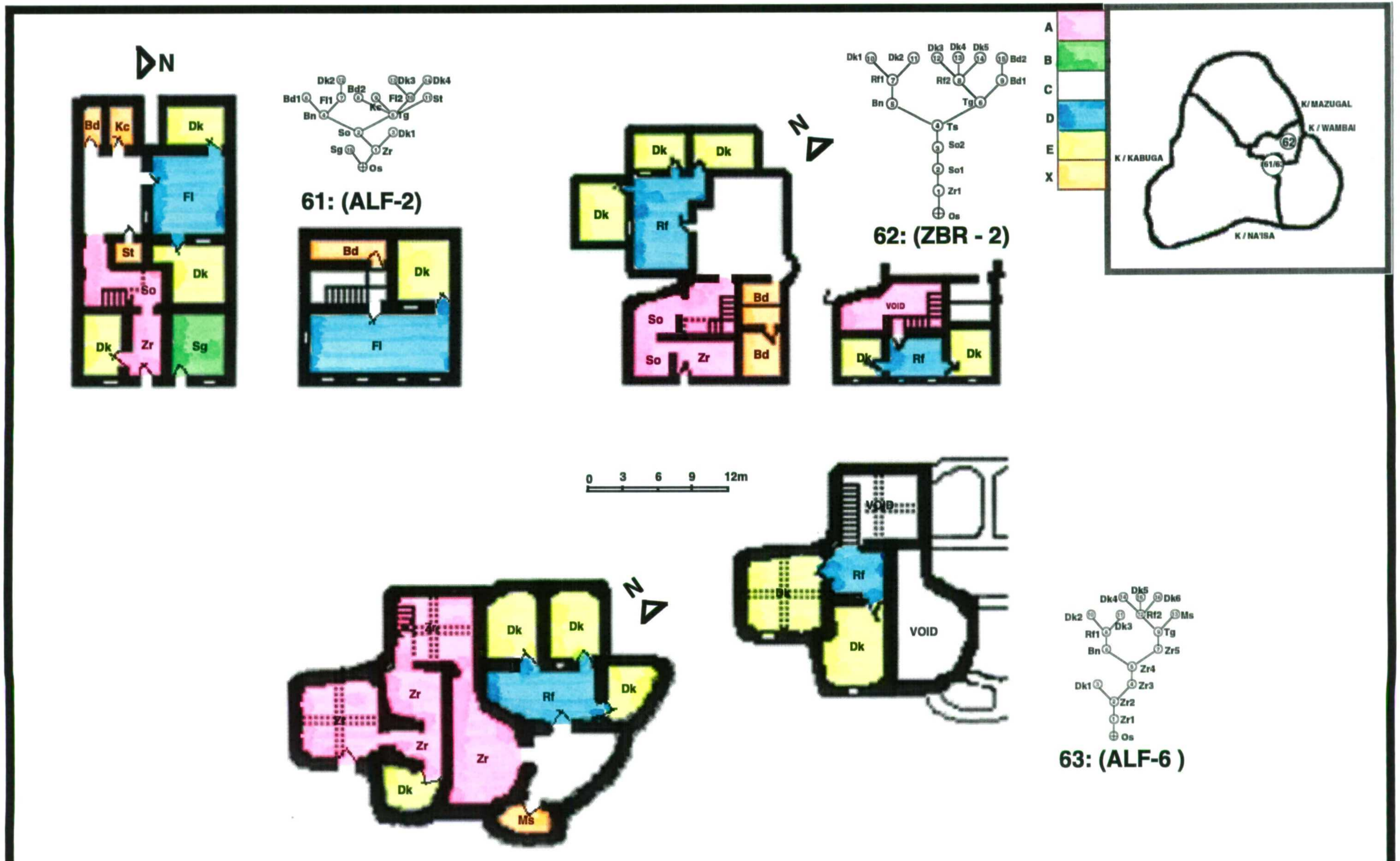

FIGURE 5.4a : SINGLE FAMILY ; 16 - 20 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

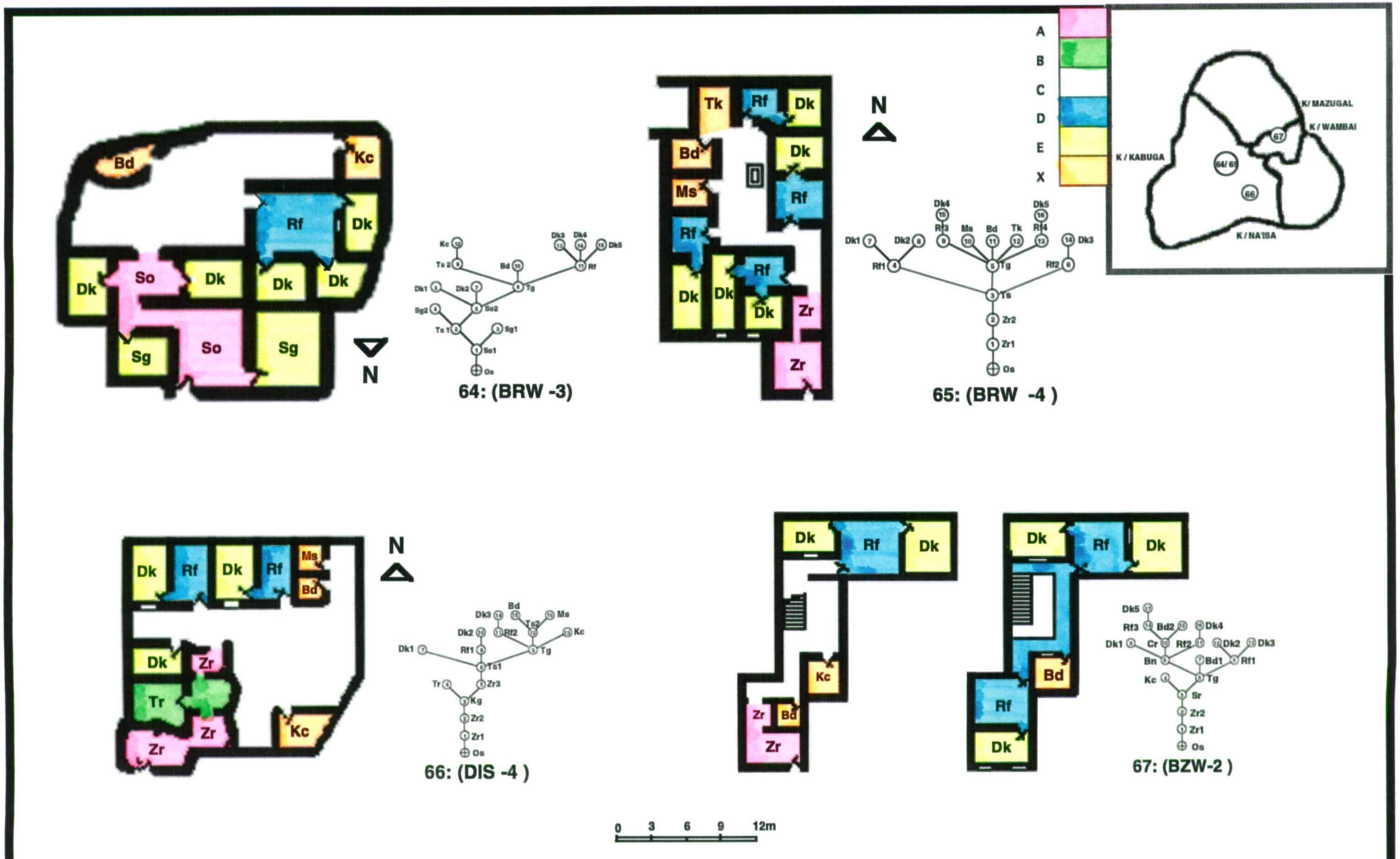

FIGURE 5.4b; SINGLE FAMILY 16 - 20 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.4c: SINGLE FAMILY ; 16 - 20 K- Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

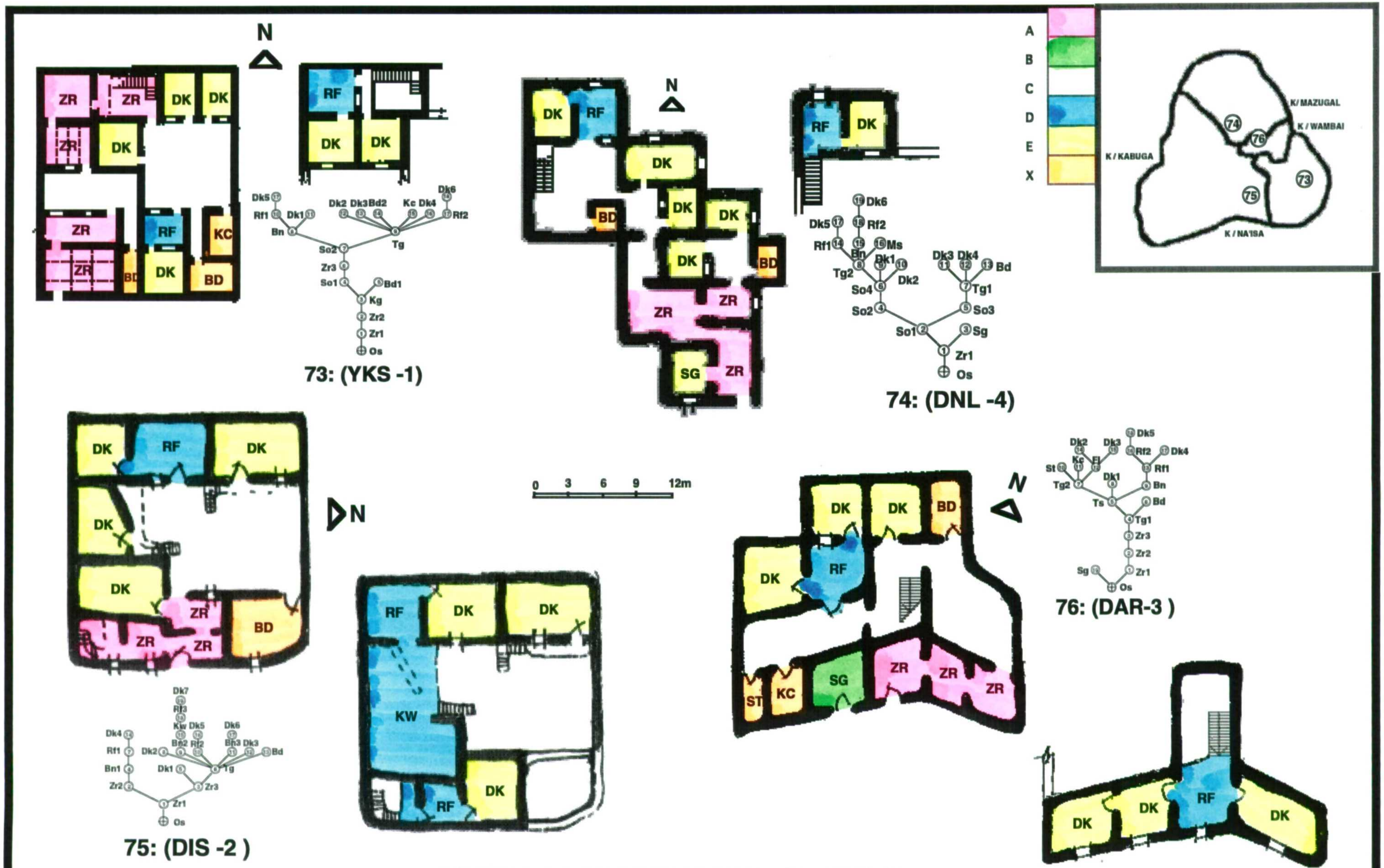

FIGURE 5.4d :SINGLE FAMILY ; 16 - 20 K -Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

All the houses, were constructed just after independence, that is in the early 1960's. The exception is **House 81** for which there is reason to believe that it was constructed well before the advent of colonialism in 1903. However it had undergone several major changes, the last of which was between the two World Wars when the upper storey was added. It is one of the two houses with an outer yard (the *ƙofar gida*), the other being **House 77** which is shallowest from the outside.

Syntactically these houses all exhibit tree-like justified graphs that are bifurcated because of the upper storeys. Depth from the outside ranges from 7 to 11 steps deep. All courtyards (*tsakar gida*) except that of **House 78**, are at least 4 levels deep from the exterior.

5.3.1.5 Single Family Houses (NR), ≥ 30 K Spaces.

This is the smallest sub-group in the single family non-ringy house group (**Figure 5.6**). Nothing could be said about the time these houses were constructed but their respective sizes and shapes suggest that they are significantly old. As is common with all old Hausa houses (Schwerdtfeger 1982; Moughtin 1985; Dmochowski 1990) they have undergone several changes and modifications. A good instance of this is **House 84** which has a 3-chamber ruin clearly visible in the outer open yard. It was gathered that some 50 years earlier the house was accessed via the ruins, that is the *zaure* (entrance hall) used to be where the ruin is. In more recent times there used to be an outer and inner room (*rumfa* and *ɗaki*) . This and **House 83** are similar in many respects; both have tree-like but bushy justified graphs and both are 9 levels deep from the exterior. Similarly their courtyards are 5 steps from outside.

In contrast to the other two houses in this sub-group, **House 85** 's justified graph is not bushy and at 12 levels deep it is one of the deepest houses in the entire surveyed sample. It also has the least population, 10 persons compared to the other houses which have 19 and 33 persons respectively. But perhaps the major difference between this and the other houses is the fact it belongs to a once palace official who still retains his palace connection as is evidenced by the horse tethered outside the house. On the other hand the other houses belong to families with no connection to the nobility. The only thing common to these 3 houses is that the three family heads consider themselves as belonging to the low income group.

5.3.2 Single Family Houses Ringy (R)

As stated above there are 18 single family houses that are exhibit rings in their justified graphs. The nature of these rings and their significance will be discussed while dealing with the spatial characteristics of the houses (infra § **8.2**) . In this chapter we will be concerned with only their locus and type. The one family houses with rings are ordered into 4 sub-groups (**Tables 5.4**). The details of each sub-group is as follows;

FIGURE 5.5a :SINGLE FAMILY; 21 - 25 K -Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

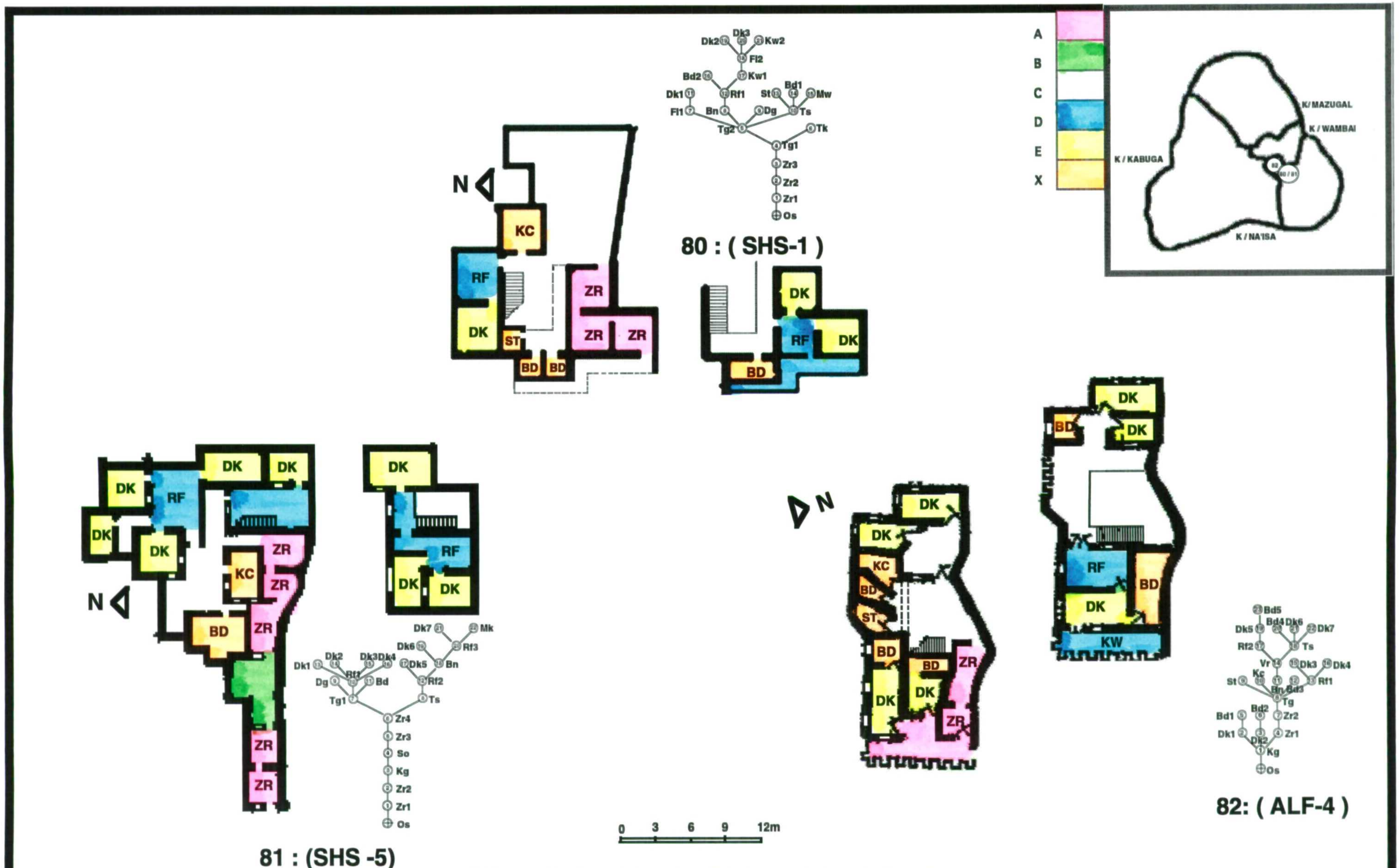

FIGURE 5.5b: SINGLE FAMILY 21 - 25 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

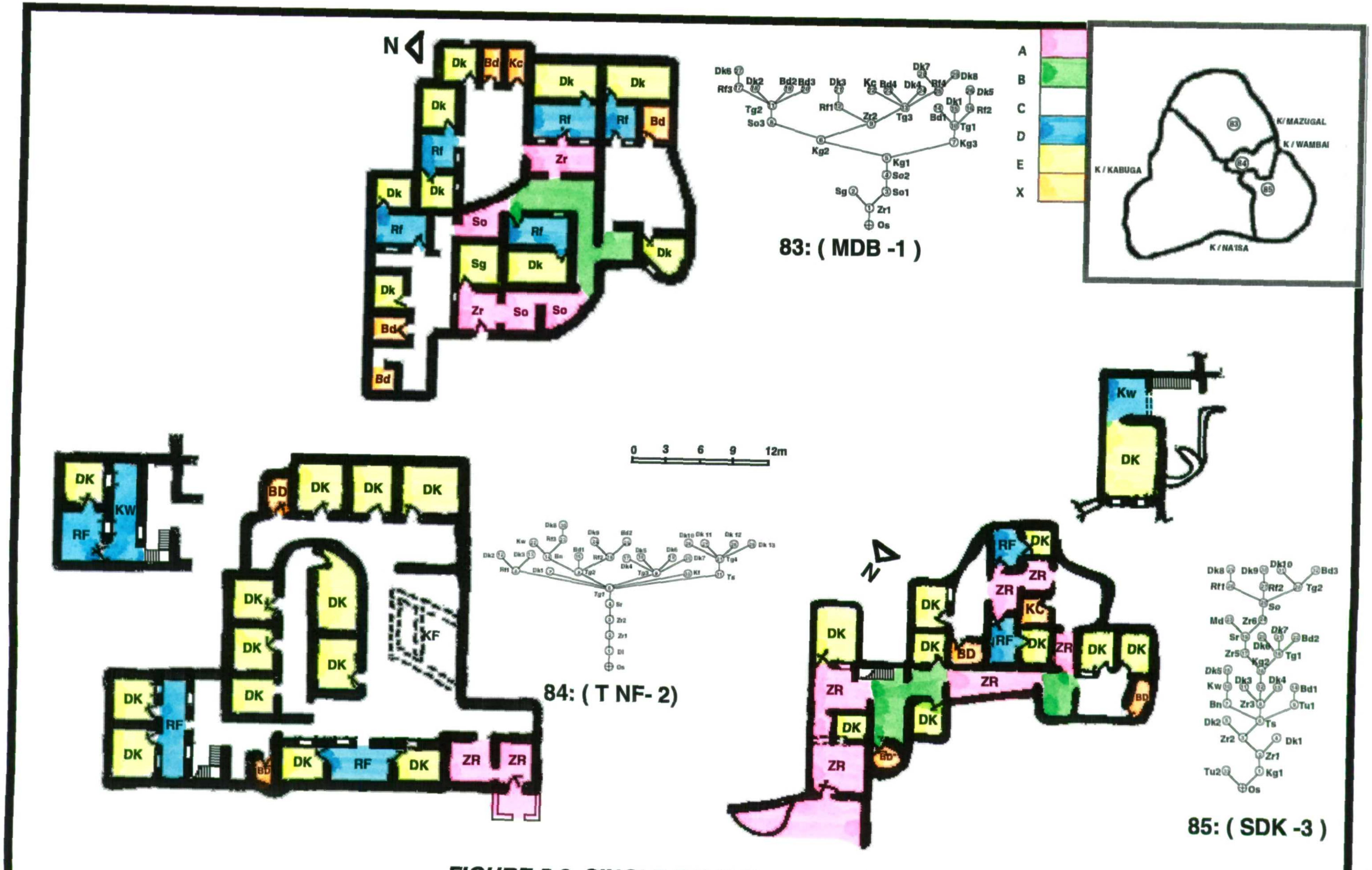

FIGURE 5.6 :SINGLE FAMILY ; $\geq$ 30 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

TABLE 5.4: ONE FAMILY HOUSES (RINGY {R}) K-SPACE DISTRIBUTION

No. OF K- SPACES	11-15	16-20	21-25	≥ 27
FREQUENCY	4	6	4	4

5.3.2.1 Single Family Houses Ringy (R) 11 -15 K-Spaces

The 4 houses in this sub-group differ from other single family houses of similar K-space size only in the fact that their justified graphs exhibit rings (**Figure 5.7**) . Thus all are single storey buildings with a mean population of approximately 7 persons per house . With the exception of **House 87** all belong to families in the low income group. **House 86** and **House 88** were constructed circa 1973 entirely with concrete blocks, while the others were constructed with adobe.

In syntactic terms **House 86** and **House 88** are very much the same because in each case the ring on the justified graph links the courtyard and the exterior of the house through an outer room (the *shago*). What is syntactically significant about this type of ring is that breaking it makes the house deeper. In other words if the door linking the outer room and the courtyard was to be closed the resultant justified graph would be one level deeper.

House 87 is different in that its ring is internal. It links the courtyard and a second entrance hall (*zaure*) through an inner room. Similarly **House 89** is also different even though it has an external ring which links the first entrance hall , the outer room and the exterior. These two rings are syntactically similar because breaking them does not change the depth of the house. It is in this sense that such rings are considered trivial.

5.3.2.2 Single Family Houses Ringy (R) 16 -20 K-Spaces

What is interesting about this sub-group is that 4 out of its 6 houses , i.e. **House 90** to **House 93** have rings that are both external and trivial (**Figure 5.8a &b**) . **House 94** has two rings one internal and the other external. What is significant is that while the external ring is trivial the internal is non-trivial. On the other hand **House 95** has a ring which is external but non-trivial.

These facts aside the houses are not much different from the single family houses of similar K-space size already discussed. Thus their justified graphs are also tree-like and most have courtyards that are shallow from the outside with the exception of **House 93** & **House 95.** The mean population size is approximately 10 persons per house. In addition all the houses here belong to the low income group. The only exception is **House 94** which is considered to belong the mid income group.

FIGURE 5.7: SINGLE FAMILY (RINGY) ; < 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

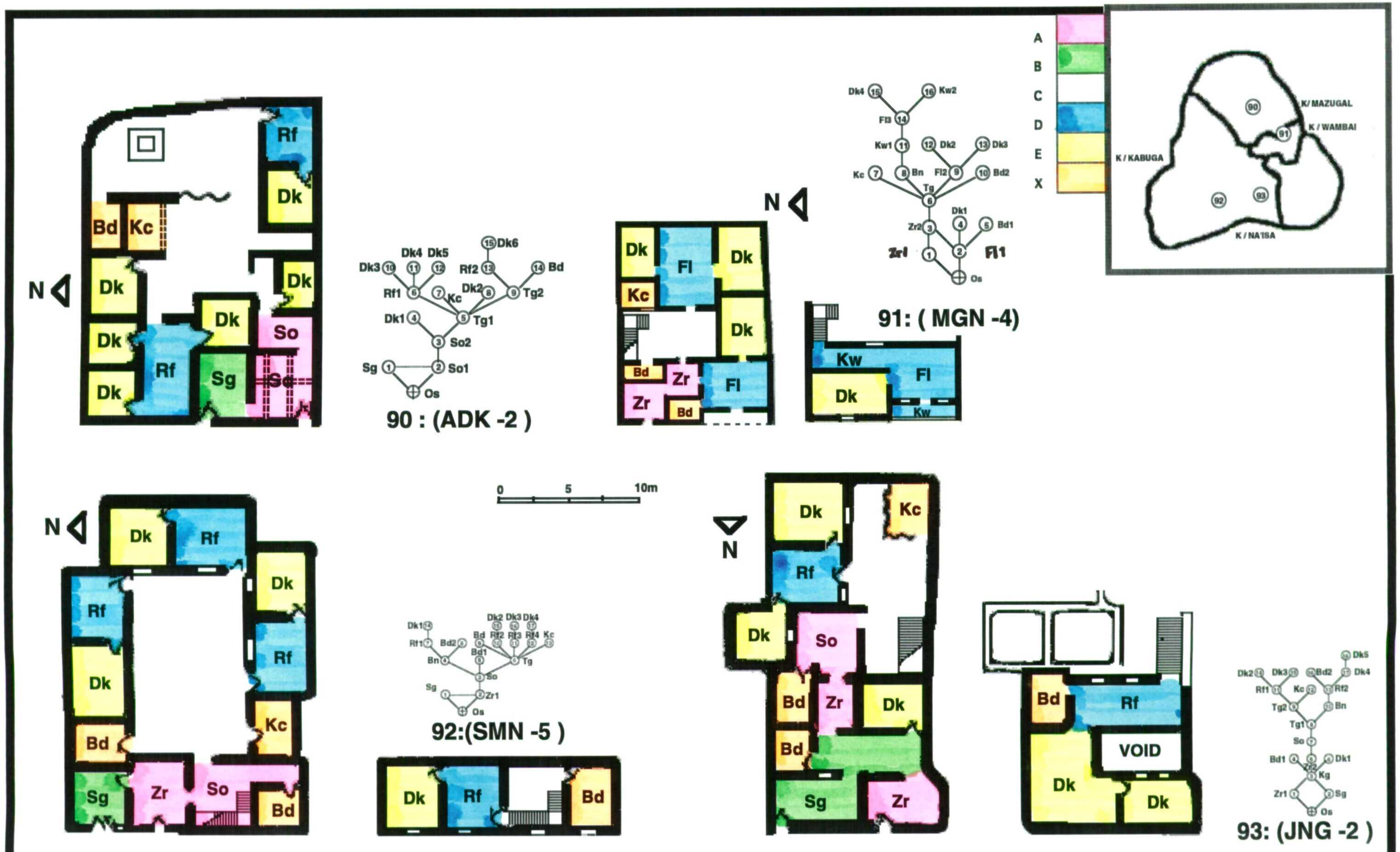

FIGURE 5.8a : SINGLE FAMILY (RINGY); 16 - 20 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.8b: SINGLE FAMILY (RINGY) 16 - 20 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl) B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg) X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

5.3.2.3 Single Family Houses Ringy (R) 21 -25 K-Spaces

Of the 4 houses in this sub-group 3 have rings that are external and trivial and therefore of little consequence (**Figure 5.9**) . **House 98** which has two trivial external rings and one non-trivial internal ring is the exception. All the houses have tree-like justified graphs and are between 6 and 8 levels deep from the outside. Other individual differences makes these houses interesting.

House 96 is one of the finest examples of adobe construction using rectangular sun dried adobe blocks rather than the traditional conical block, the *tubali.* It was constructed just after W.W.II on the site of a much older house. It belongs to a family that was once well off, but now evidently in the low income group. In contrast **House 97** was constructed with *tubali* in the early 1930's. What marks it out is its series of 4 magnificent entrance halls (the *zaure*) using the so called Hausa vault (Urvoy 1955), that is the *baka* construction. The main *zaure* has an arch which spans over 6 metres and is about 5 metres high. The walls were decorated with intricate patterns and motifs and painted in silver blue colour (Sa'ad 1981: 397).

House 98 is a fine example of the houses built by the well to do Hausa just after the Nigerian civil war (1967-1970). It belongs to a rich merchant and it was entirely built using contemporary building materials and techniques. The design of the house incorporates both indigenous as well as contemporary spatial concepts . Thus it has a garage for the merchant's car and a western type living room which can be accessed from the outside and from the entrance hall, but which opens directly into the courtyard by means of an aluminium sliding door. it is this disposition which accounts for the internal non-trivial ring noted above. In addition each of the two merchant's wives has a self -contained unit made up of a parlour, a room and a water-closet. The merchant has his apartment on the upper floor but uses the ground floor living room for receiving his guests.

House 99 is unique in many ways. It belongs to an aristocrat whose passion is horses. It has two stables and a large open space for exercising his three horses. One of the stables is right inside the house adjacent to his room. This is where his *ingarma* (prize stallion) is kept. There is a full time stable hand employed to look after the horses and to guard them at night. Curiously this aristocrat also has a car. One other way in which this house breaks with Hausa tradition is its single and comparatively small entrance hall. It looks like an after-thought considering the social status of the house owner who is considered to be in the upper income group.

5.3.2.4 Single Family Houses Ringy (R) ≥27 K-Spaces

In many respects this sub-group is very much similar to the one preceding. Again the justified graphs are tree-like and bushy. **House 100** and **House 102** have rings that are external and trivial (**Figure 5.10** {a & b}. Like House 97 in the preceding sub-group these houses were constructed of the conical adobe blocks most probably in the early 1930's.

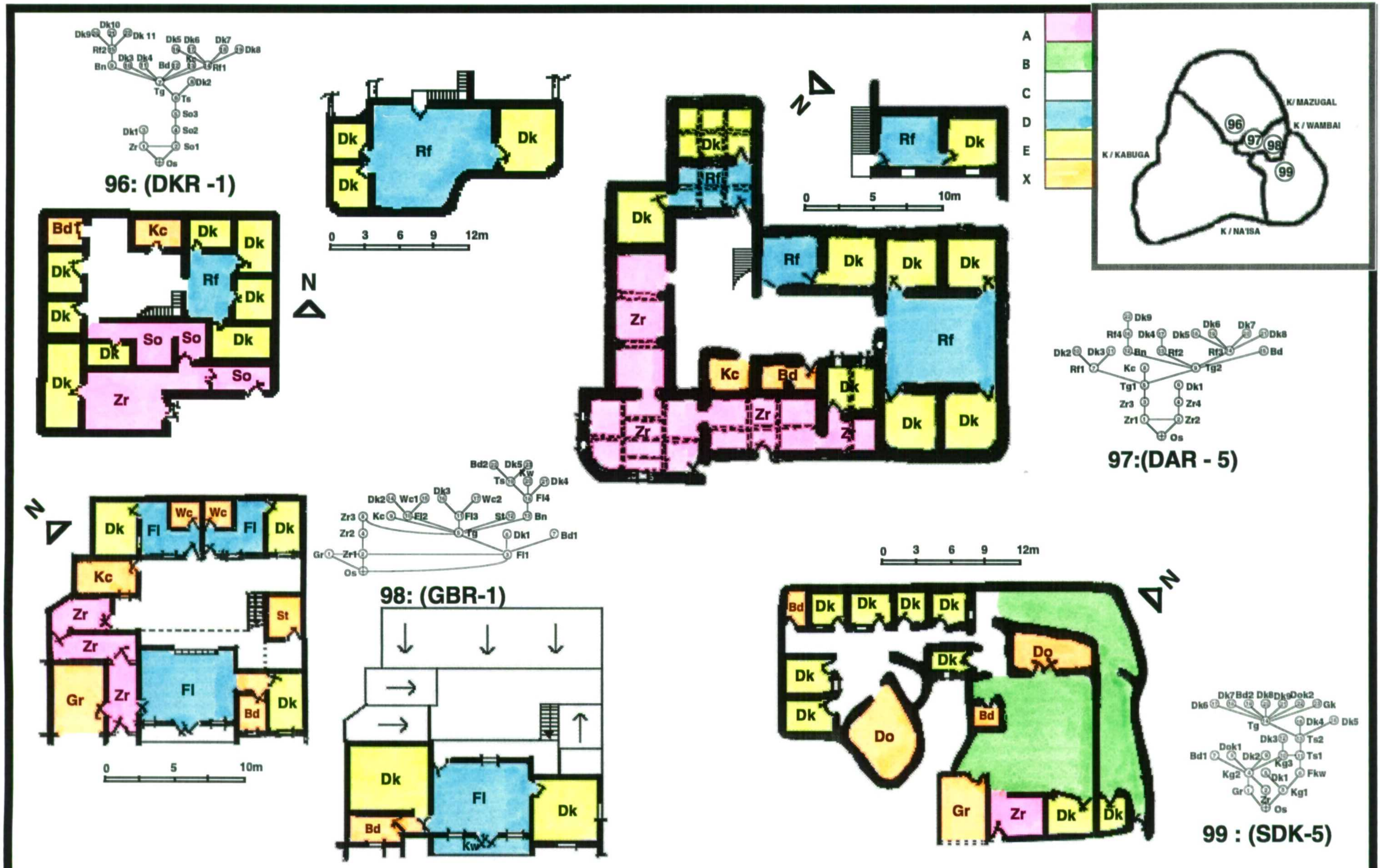

FIGURE 5.9: SINGLE FAMILY (RINGY) 21 - 25 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.10a: SINGLE FAMILY (RINGY) ≥ 26 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.10b : SINGLE FAMILY (RINGY) : ≥ 26 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

Their owners belong to low and mid income group respectively. **House 101** and **House 103** on the other hand are very much similar to House 98, especially in the way they are constructed. Syntactically though, House 101 is closer to House 98. It has two rings, one external and trivial and the other internal and non-trivial. This is perhaps the reason why it has the least depth from outside compared to the others. House 103's ring is internal and trivial. Both houses are owned by successful merchant. The mean population size is approximately 13 persons per house.

5.4 Two Family Houses

In the two family category there are 31 houses (**Figures 5.11-14b**), of which more than one half have under 15 K-Spaces, and only 4 have over 20 K -Spaces (**Table 5.5**).

TABLE 5.5 : TWO FAMILY HOUSES K-SPACE DISTRIBUTION

No. OF K- SPACES	≥10	11-15	16-20	≥20	RINGY
FREQUENCY	5	13	6	4	3

The justified graphs of all the houses are tree-like, with only three exhibiting rings . **House 132** and **House 134** have rings that are both external and trivial. **House 133** presents an interesting case. In actual fact it is made up of two houses belonging to two brothers. It is the door (the *madudduka*) that connects the two courtyards which is responsible for the ring exhibited in the justified graph. Although closing this door does not make the justified graph deeper, yet it alters it in one fundamental way by physically separating the two houses . In the same vein **House 131** is actually two houses linked by an outer yard (the *farfajiya*). But although the two houses belonging to a man and his married son are physically separate, yet both consider it to be a single house. In contrast, the two brothers owning **House 133** are under no such impression despite the door linking the geographical centres of the two houses[107].

More than 75% of the houses are single story, and like the single family houses of similar K-Space size mostly belong to families in the low income group. Spatially the houses also exhibit similar characteristics to those of the single family houses , though most of them are irregular in shape; a reflection of their mode and material of construction. Most of the houses are 5 or 6 steps deep from outside, but **House 131** is 10 steps deep from the outside.

The mean number of persons per house is approximately 12, but most of the houses have a population of 10 or more persons. It was possible to determine accurately the date of construction of only 5 houses , namely **House 106, House 128, House 130, House 131**and **House 134.** The first 3 were constructed in the early 1950's and the other two in the

[107]One possible explanation for this is that the owners of **House 133** thought the survey was conducted for the purpose of evaluating their property for compensation in the event of a government appropriation for road construction. The owners of **House 131** on the other hand had no such fear, the house being right adjacent to a major road.

FIGURE 5.11: TWO FAMILY; ≤ 10 K- Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

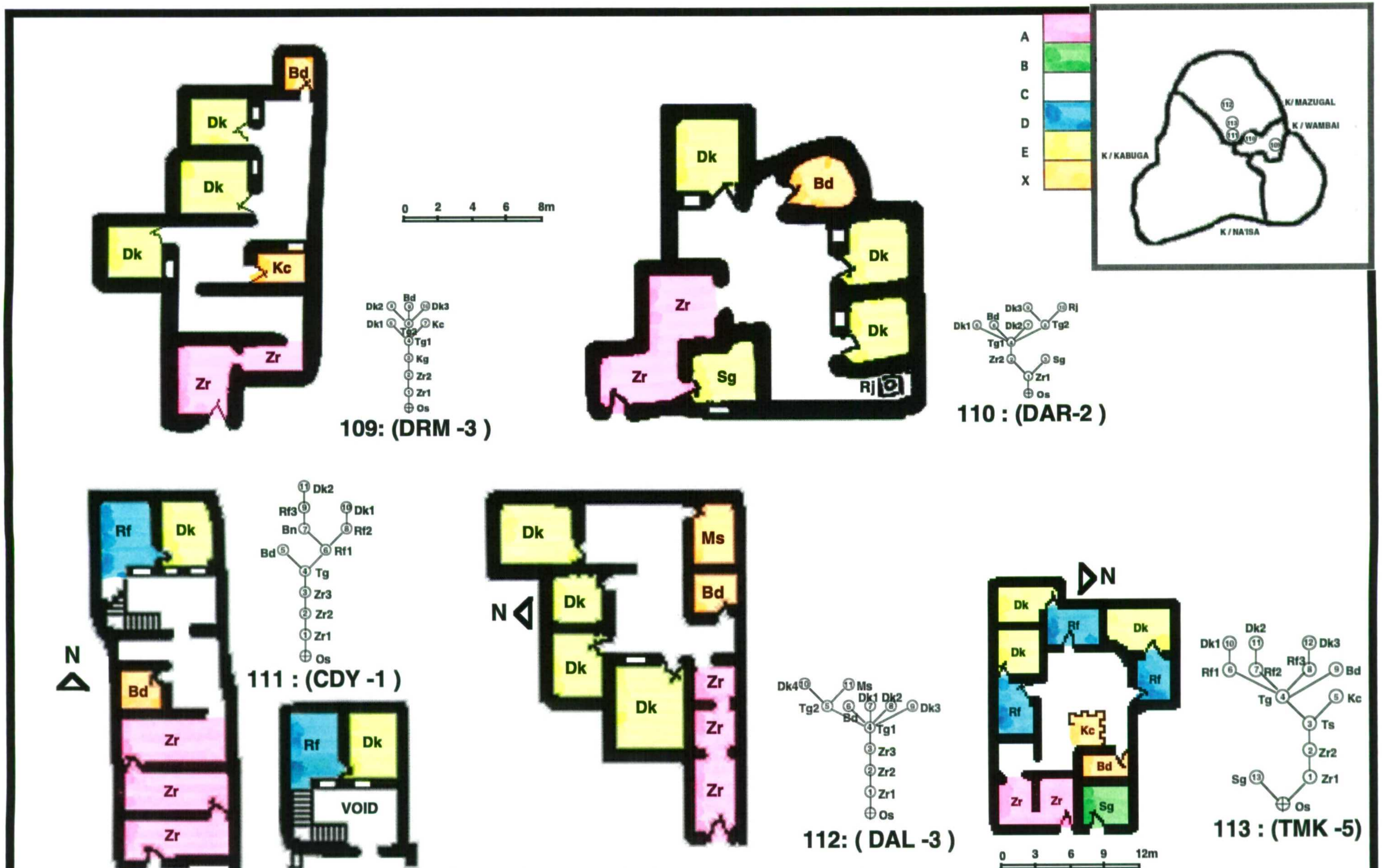

FIGURE 5.12a : TWO FAMILY ; 11 - 15 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.12a : TWO FAMILY ; 11 - 15 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

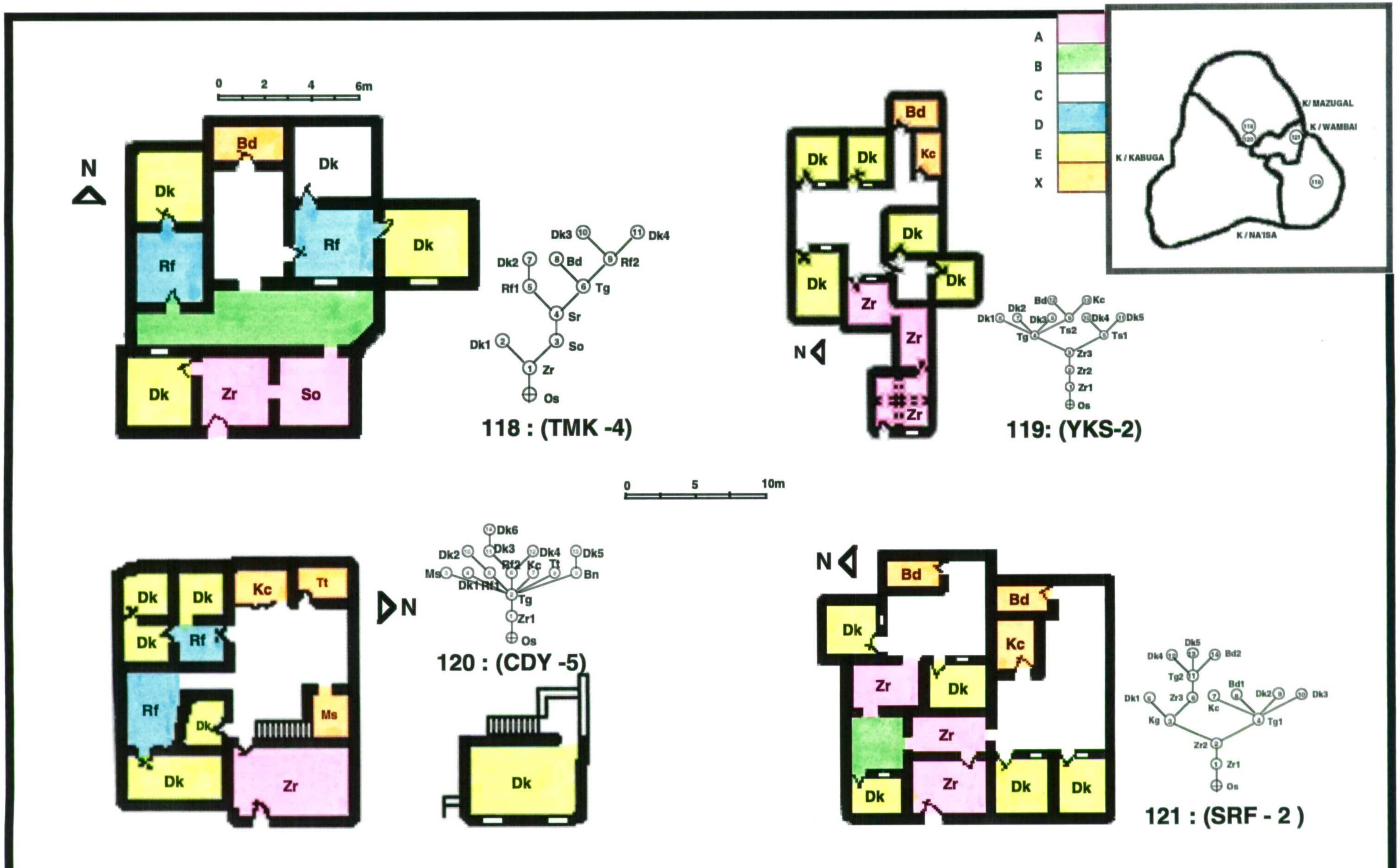

FIGURE 5.12c: TWO FAMILY 1; 11 - 15 K-Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd);Shago (Sg); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

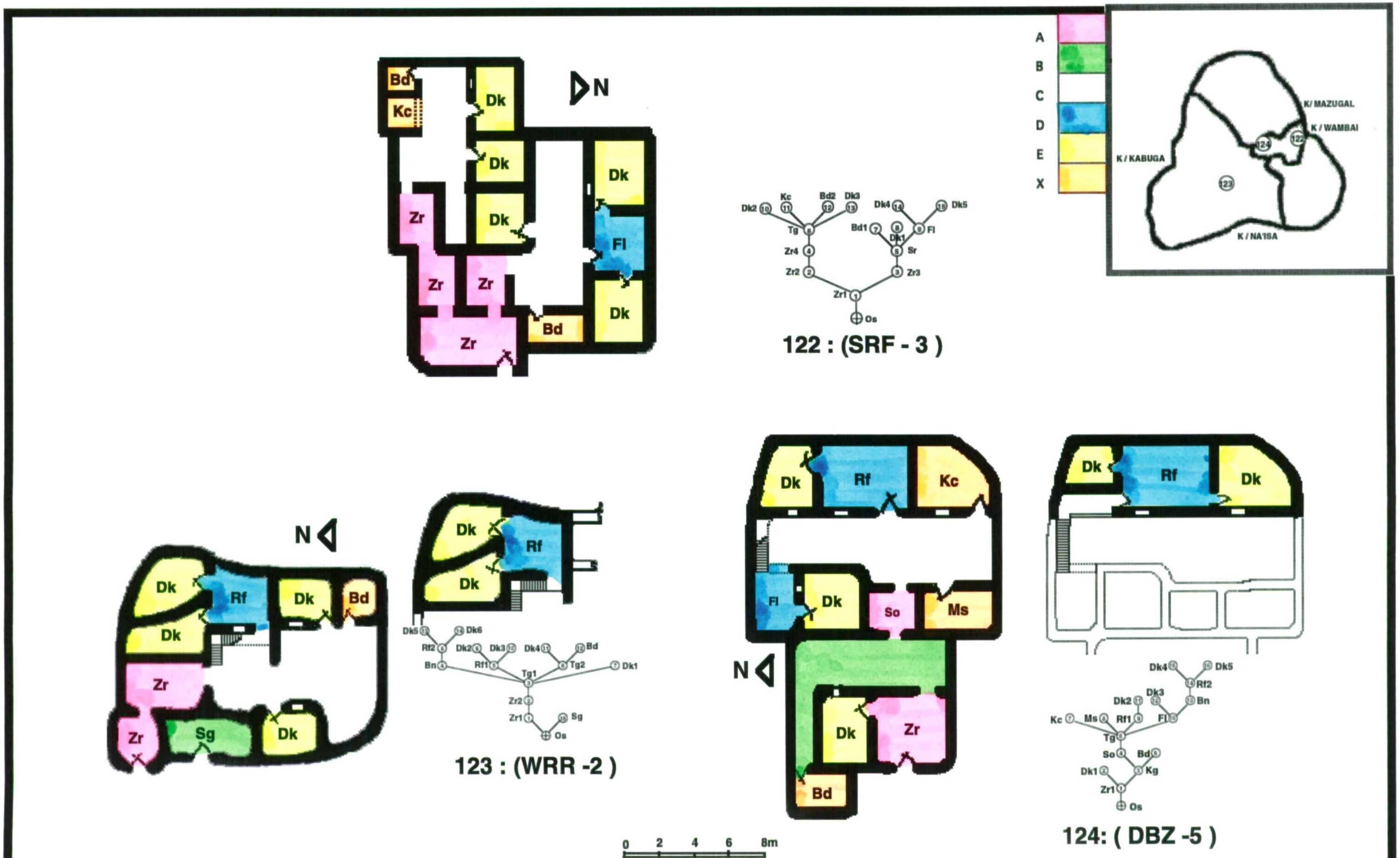

FIGURE 5.13a : TWO FAMILY; 16 - 20 -K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

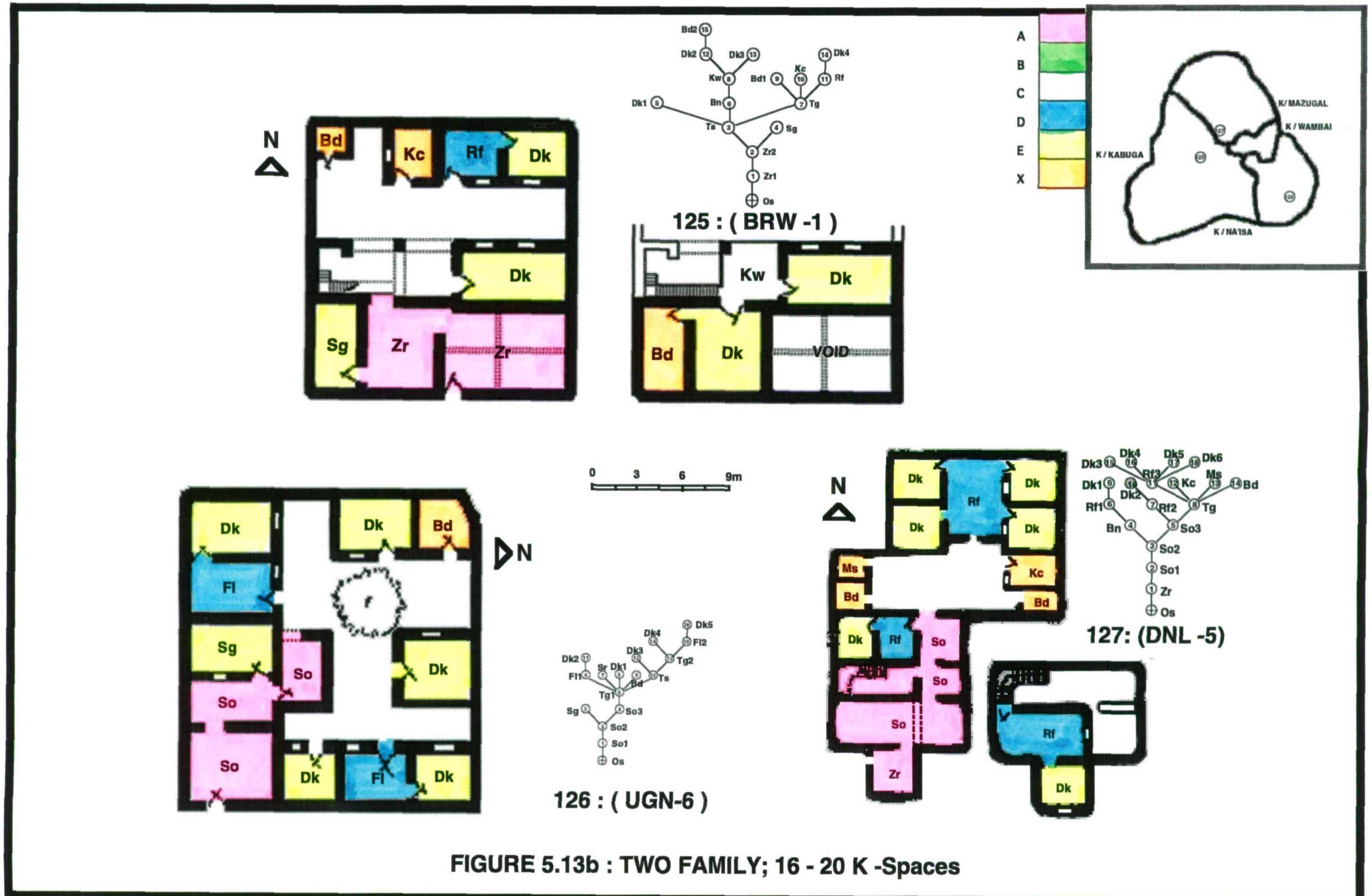

FIGURE 5.13b : TWO FAMILY; 16 - 20 K -Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

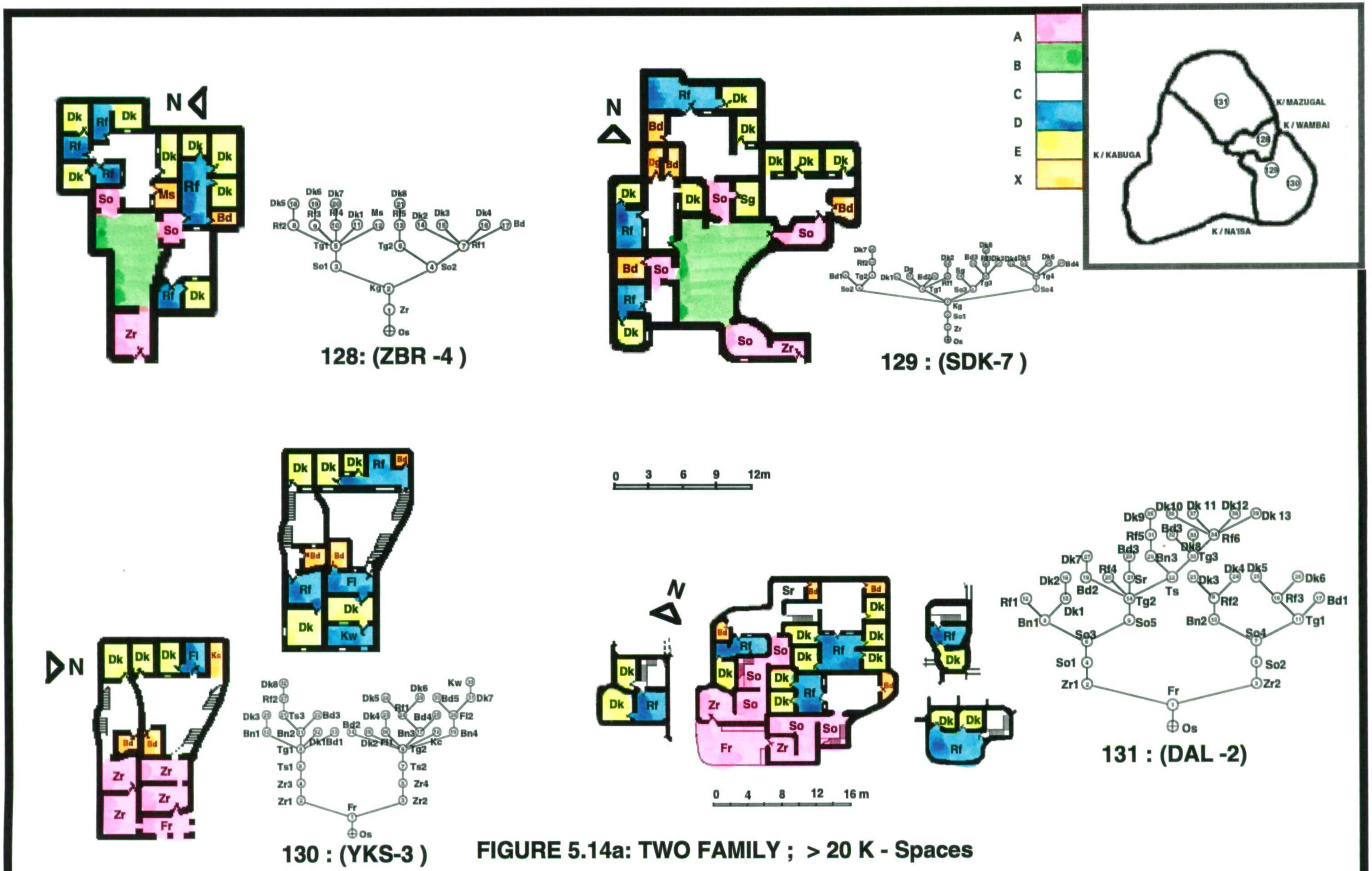

FIGURE 5.14a: TWO FAMILY ; > 20 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

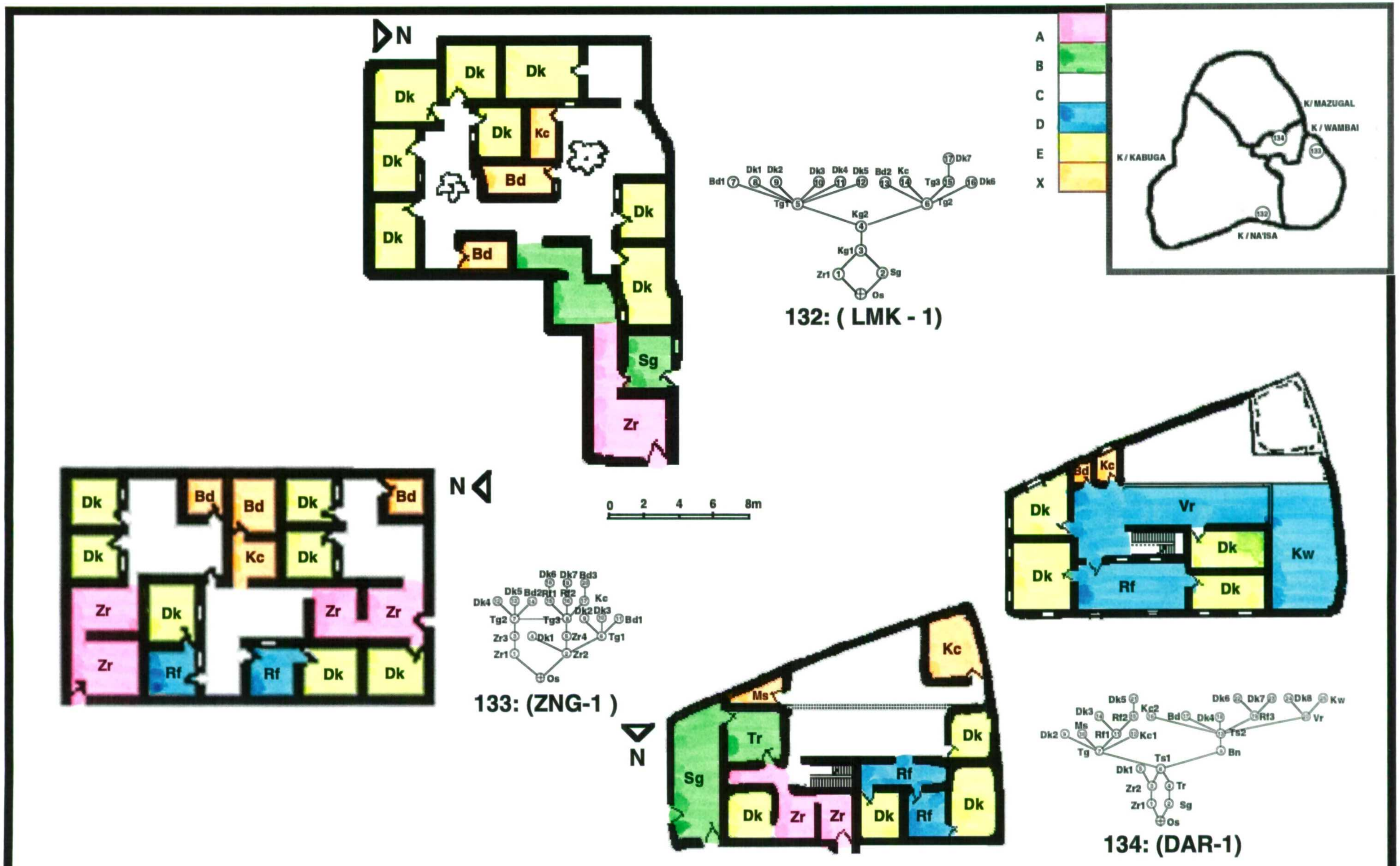

FIGURE 5.14b: TWO FAMILY (RINGY) ; > 20 K -Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

early 1940's. However it seems **House 122** and **House 129** are probably much older than any of the houses in this category. Interestingly **House 122** is a split-house, so also **House 104, House 107 and House 112**.

In sum the major difference between this group of houses and those in the preceding group aside from family size, is the presence of what may be termed the ' two-tier ' house, that is a house with two separate and independent sections but linked by means of a space or door and socially considered as one. However without this link the two houses could still exist as physically separate entities.

5.5 Three Family Houses

There are 8 houses in this category of which only 3 have over 15 K-Spaces (**Figure 5.15-5.17**). Many similarities exist between the houses in this category and the two family houses. First, all the houses have tree-like justified graphs two of which exhibit rings, one internal and the other external but both trivial. Most of the houses are between 6 and 7 levels deep from the outside.

Only 3 of the houses are two stories, and like the two family houses most belong to families in the low income group. The number of people accommodated in a house ranges from 8 to 21, but the mean population size is approximately 13 persons per house. Certain facts about the individual houses are worth noting. The first and perhaps the obvious is that **House 137** is a two-tier house, the link space being the first entrance hall (the *zaure*). What is not so obvious is that it is also a 'split-house'. **House 141**, the house with the internal ring is another 'split-house'. But what makes this category uniquely interesting is the fact that **House 136** and **House 139** are rented houses. In each case only tenants live in the house and the owner of the house does not. In fact one of the apartments in the latter house is empty house, otherwise the house would have been categorised under the 4 family houses. This house was built in 1965.

5.6 Four Family Houses

This category differs from the one preceding it in several ways. First, it has 9 houses (**Figure 5.18 -5.20**), which are significantly larger in terms of the number of K-Spaces. Secondly, these houses are much older and it is generally accepted in their respective localities that these houses are of considerable age. Despite this it was not possible to accurately determine their ages, although **House 144** and **House 149** seems to be the most recent and the oldest respectively. What was not difficult to establish is the fact that all of the houses have undergone notable changes in the last 3 or 4 decades. These range from simple re-roofing to extensive rebuilding. For instance **House 146** , a 'split' house, has had significant parts of it rebuilt in the 1950's. Similarly **House 147** has in recent years had the whole of its front part reconstructed with

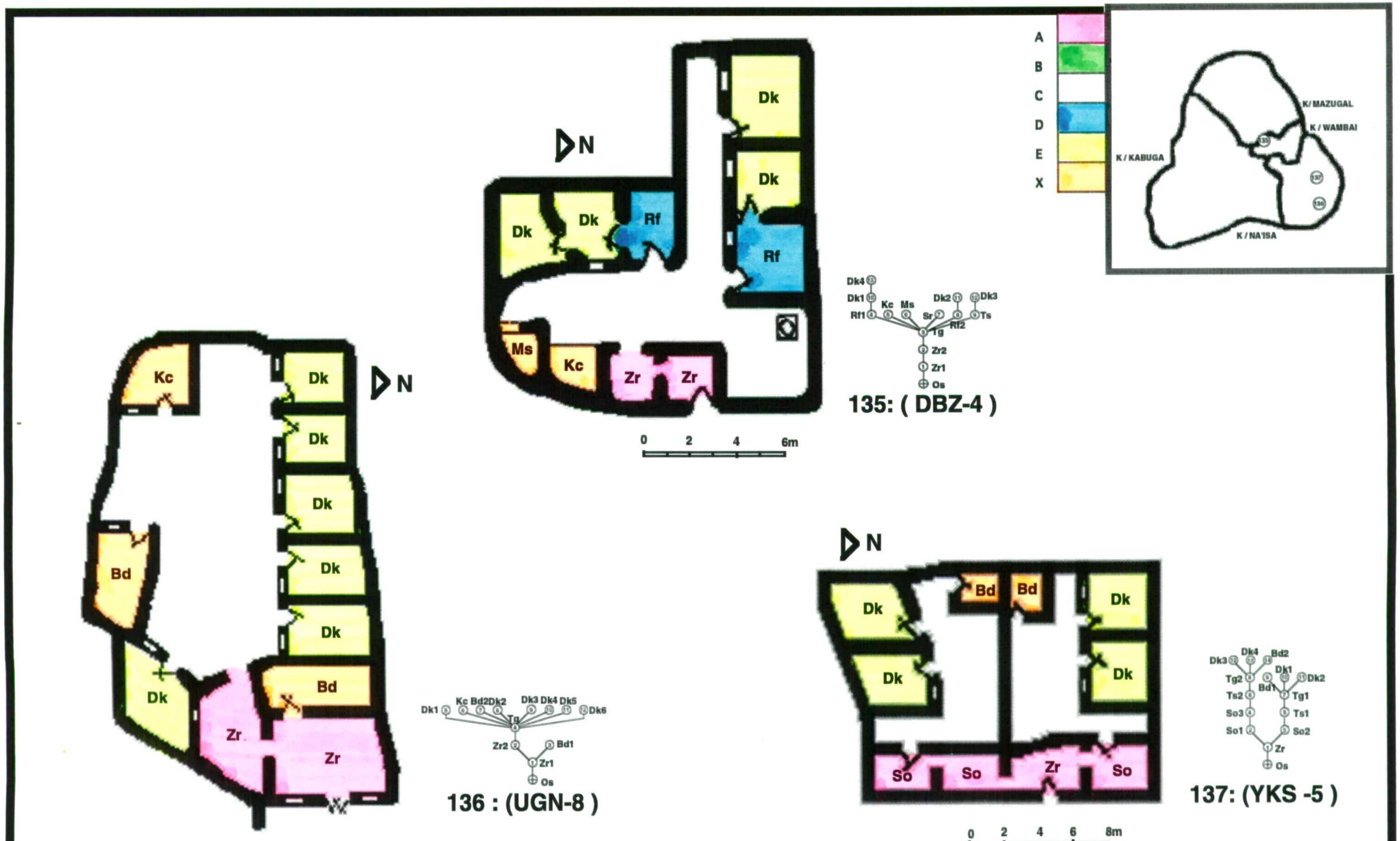

FIGURE 5.15 : THREE FAMILY; <15 K -Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

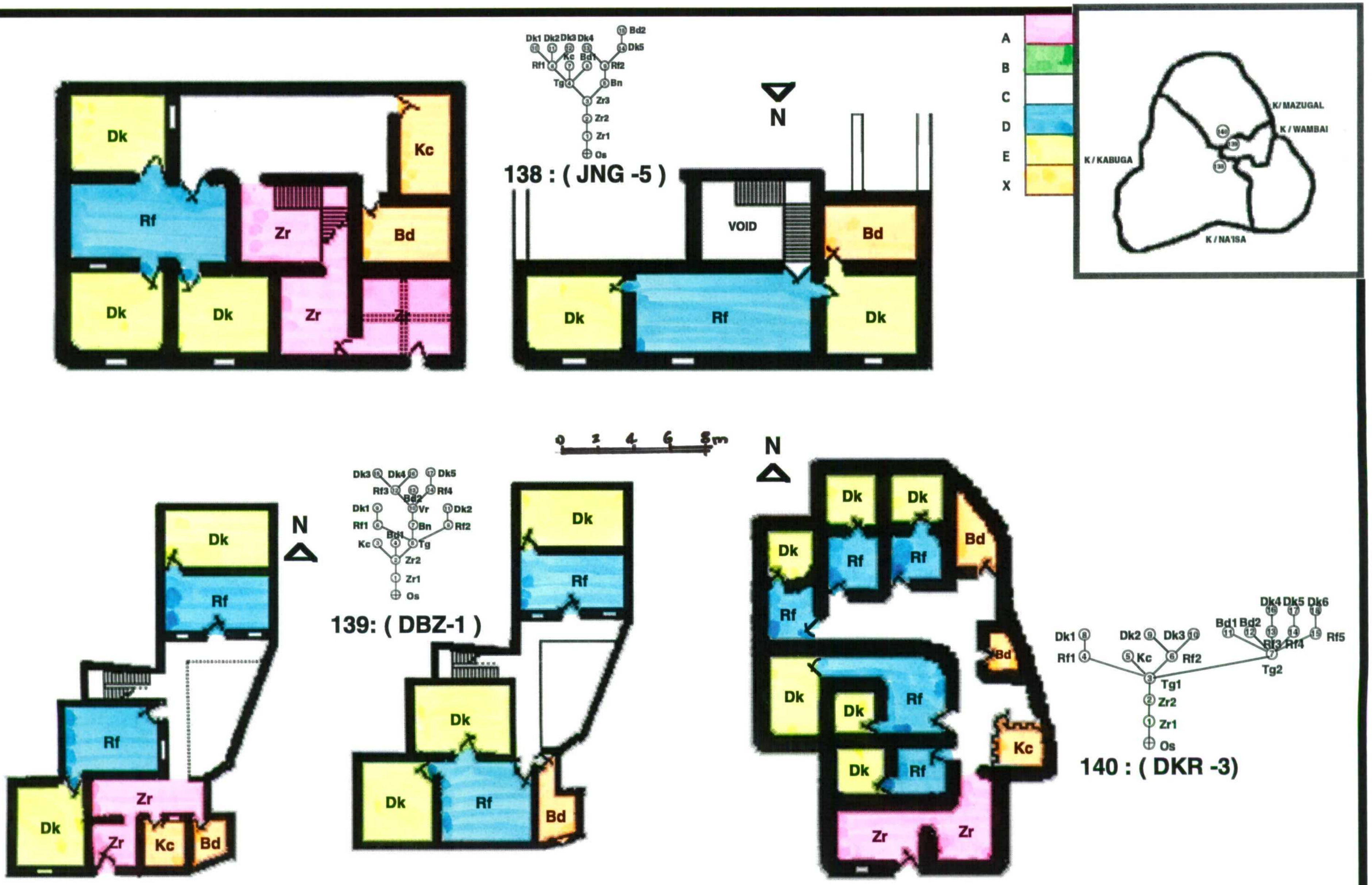

FIGURE 5.16 : THREE FAMILY ; 16 - 20 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

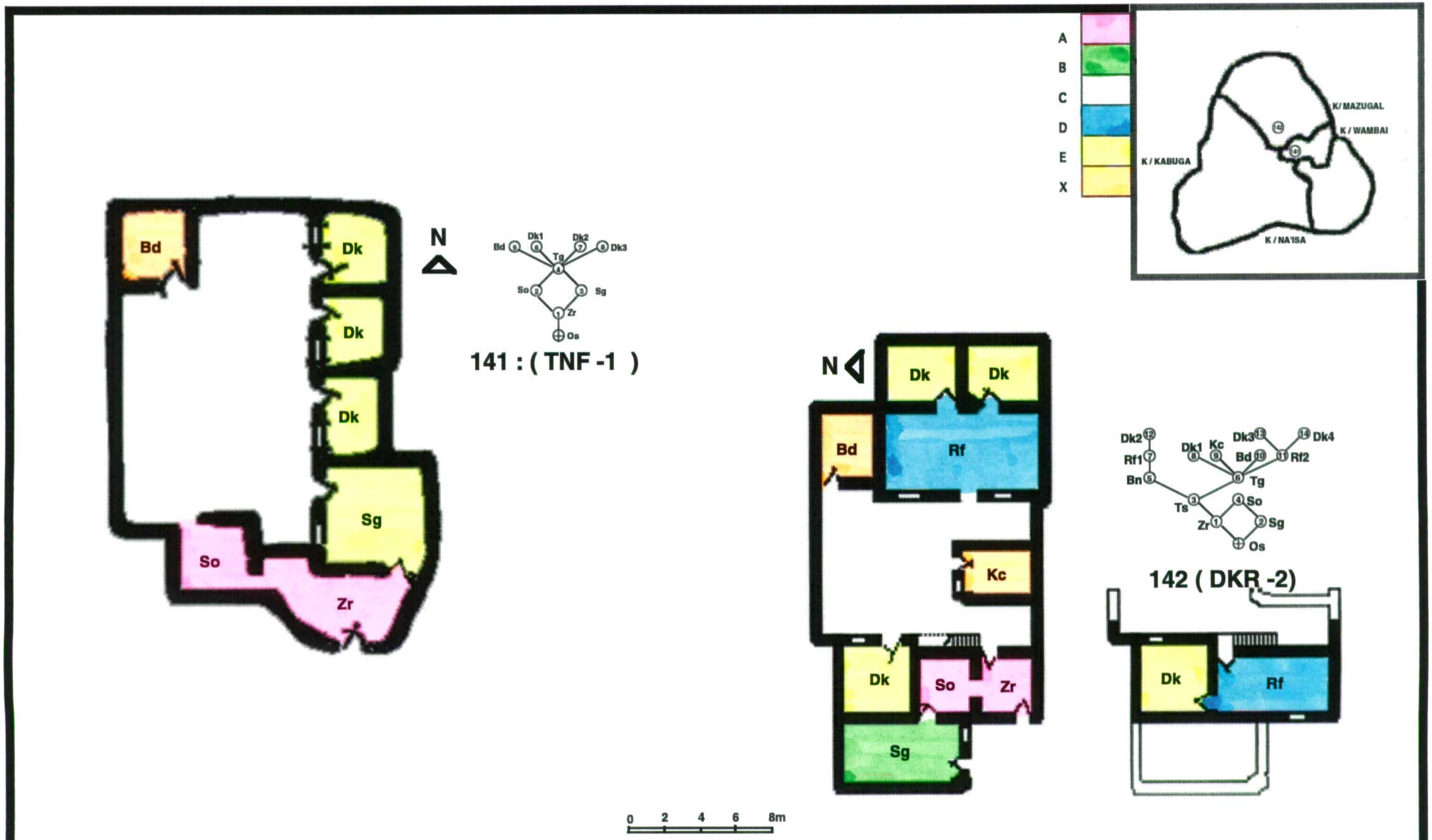

FIGURE 5.17 : THREE FAMILY (RINGY) ; < 15 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.18 : FOUR FAMILY ; < 20 K- Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

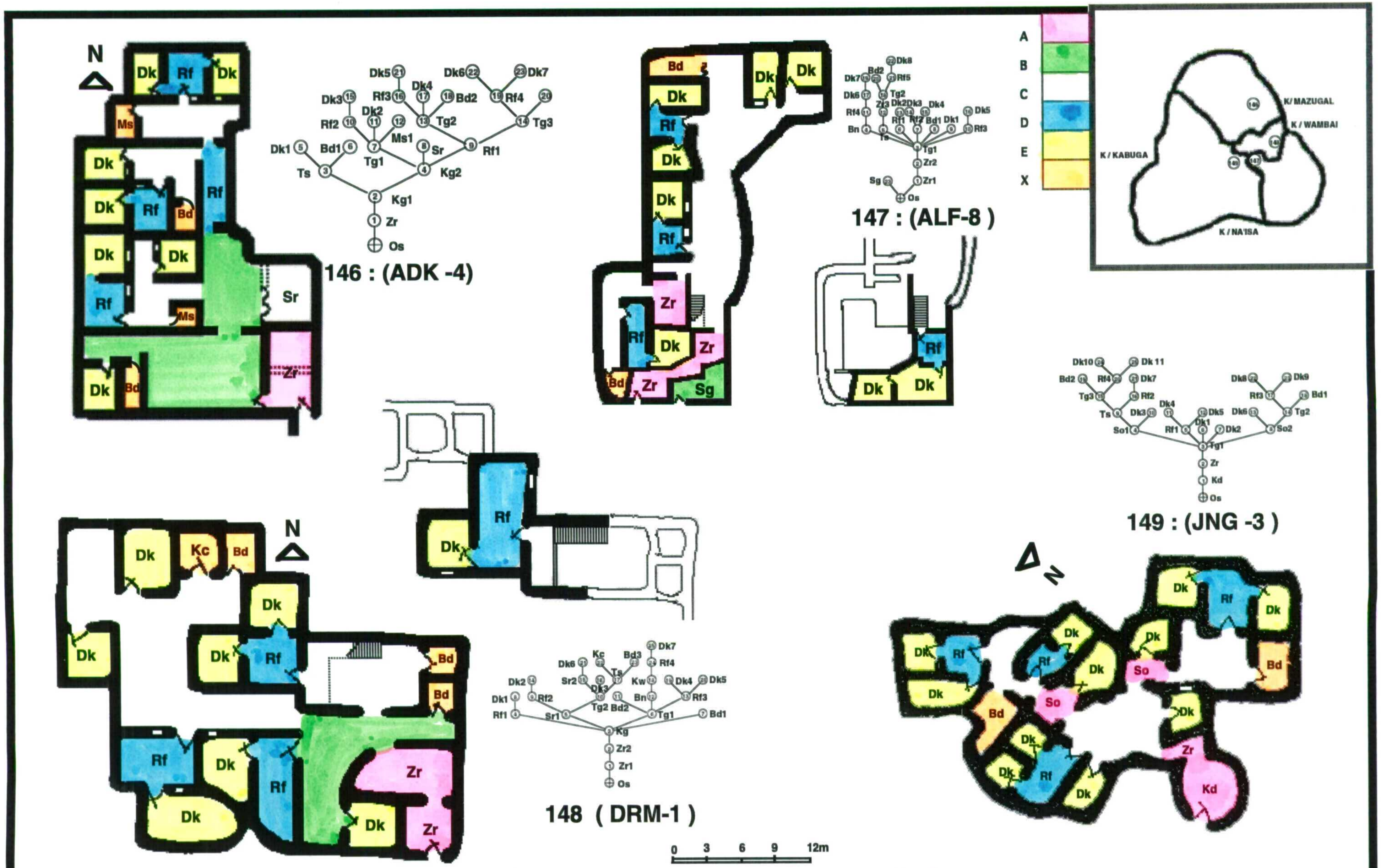

FIGURE 5.19 : FOUR FAMILY; 20 - 30 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

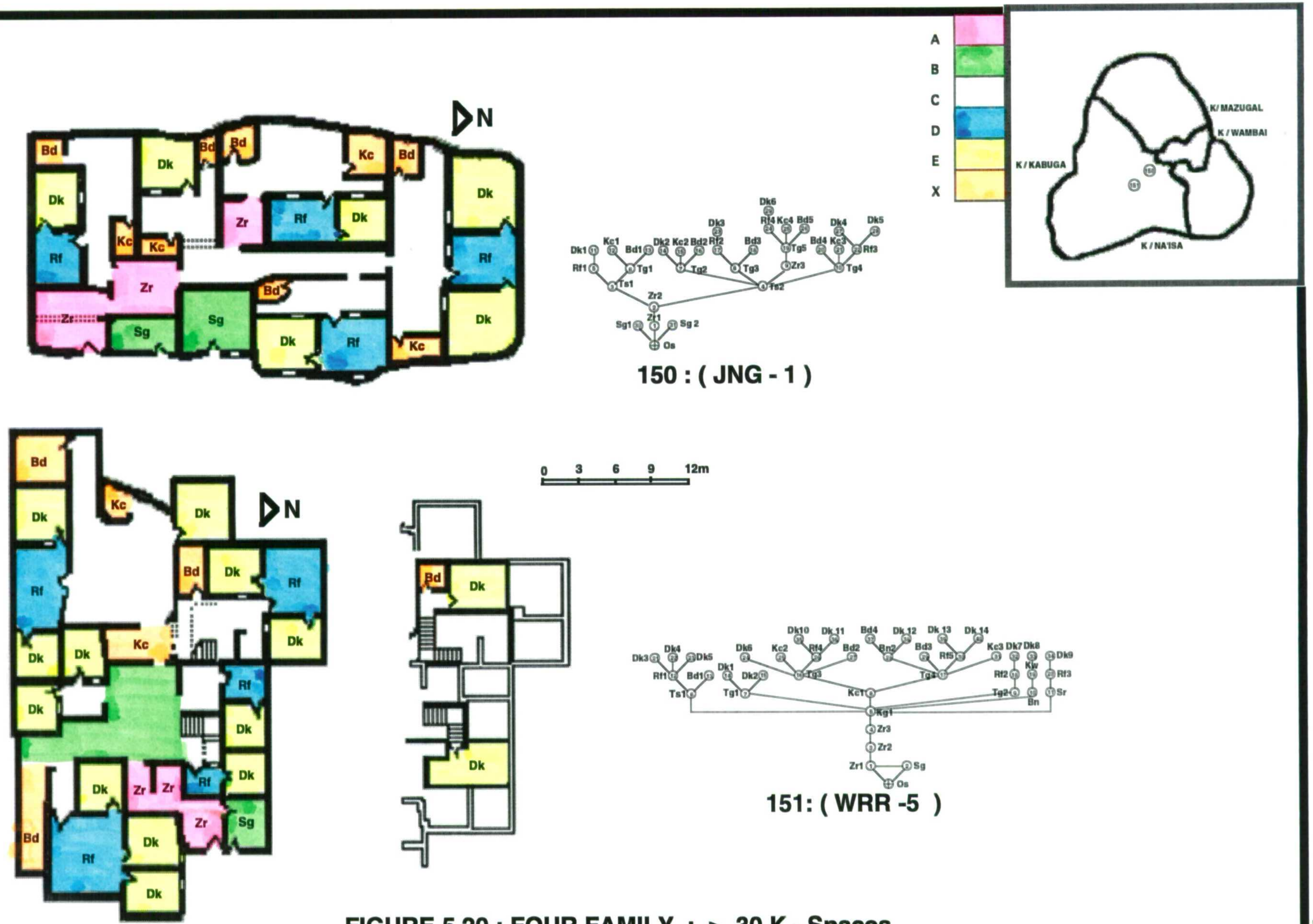

FIGURE 5.20 : FOUR FAMILY ; > 30 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

concrete blocks and roofed with corrugated iron sheets; a trend which is still popular in the walled city (see infra **Chapter 6**).

Thirdly, the houses here show less variation in terms of depth from outside and number of people accommodated. All the houses are 7 or 8 levels deep and accommodate between 20 people, making for a mean population of 30 persons per house.

Syntactically however, these houses are very much similar to those in the preceding group. They all have tree-like justified graphs, with only one justified graph exhibiting a ring. This is both external and trivial. One other aspect in which they are similar to those of the preceding group is the fact that most of the house owners belong to the low income group.

House 150 and **House 151** have fascinating histories. The former used to be the official residence of the Chief of Panegyrists (*sarkin bambaɗawa*). The latter was once the second residence of the *Turaki*, an important slave official in charge of the maintenance of the kings private apartments. Oral tradition has it that after the Kano Civil War of 1892, the house was given to an official in the smithing guild, the *turakin ƙira*. Although now there are no such title holders, these houses are still occupied by the descendants of the last holders.

5.7 Five Or Seven Family Houses

There are 2 houses each with 5 and 7 families making for a total of 4 houses in this category (**Figures 5.10 & 5.11**). In many respects these houses are very much similar to the 4 family houses, for instance their owners all belong to the low income group but there are also some differences. They are all single storey houses constructed mainly with adobe conical blocks (the *tubali*). **House 155** though, has had extensive parts of it rebuilt with sun-dried rectangular adobe blocks. **House 154**'s perimeter wall has collapsed in some parts and as an interim measure, corrugated iron sheets were used to cover the gaps.

Syntactically they all exhibit tree-like and bushy justified graphs with no rings. In addition they are all between 7 and 9 levels deep from outside. The minimum , maximum and mean population size is 24, 52 and 40 persons per house, respectively.

House 152 and 155 belong to blacksmith families who still practice the trade in the large open shed in front of the house and in the first entrance hall respectively. The ages of the houses were indeterminate but it seems **House 153** is the oldest. Unconfirmed oral tradition attributes its construction to the famous 19 th. century Jihadist Mallam Danbazau (See infra **Appendix 2**).

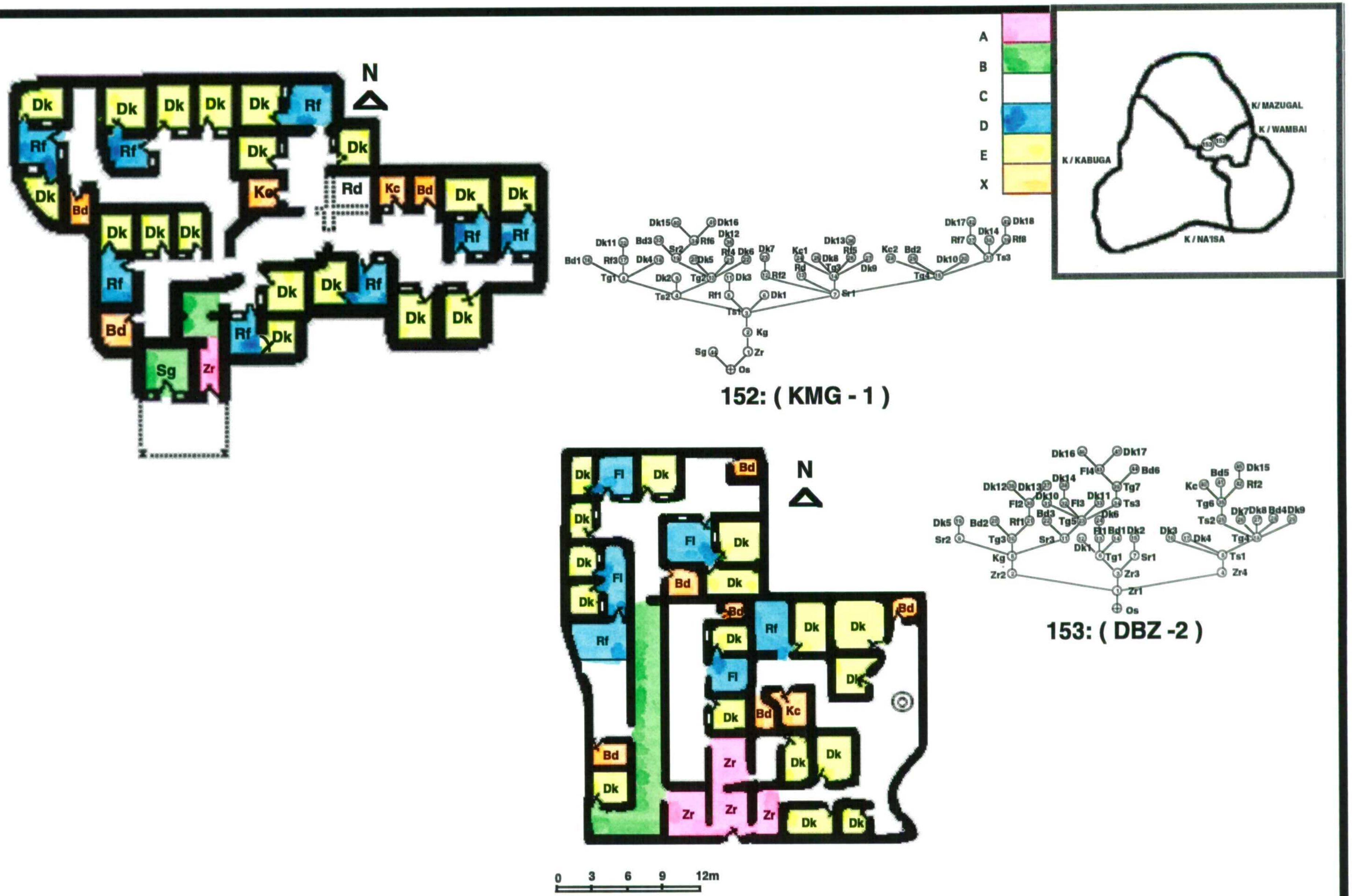

FIGURE 5.21 : 5 FAMILY ; > 40 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.22 : SEVEN FAMILY ; 30 - 50 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

5.8 Eight Family Houses

The 5 houses in this category present a unique case and hence will be considered individually. Each is a fine example of what was earlier referred to as Big House or *babban gida* (See supra **§3.4**). To recapitulate this is a house made up of several families usually related. Each family has its apartment or section called *sashe* (Schwertdfeger 1971)[108], and accessed from a series of common spaces, usually one or more entrance halls (*zaure*) and inner open yard (*ƙofar gida*). A major distinguishing characteristic of the Big House is family ownership, that is the house does not belong to one single individual but is owned by the inhabitants collectively. Naturally they are almost invariably inherited.

House 156 (**Figure 5.23a**) is the house of the Sarkin Maƙera, the traditional head of the Blacksmiths guild, a trade that is exclusively male in its outlook and practice (Jaggar 1975 & 1994). It is one of the few crafts where females contribute almost nothing towards its practice, unlike for example leather works or tailoring. In the last few decades, practice of the craft in the house has declined and the house no is longer the centre of livelihood it used to be. Currently most male members of the family earn their living from other means. This has resulted in the house being partitioned in such a way that 2 out of its 8 sections have become detached from it. Despite this physical separation a strong sense of communality still exists and the 2 sections are still considered parts of the house.

Syntactically though, its justified graph shows it to be 3 separate units connected by the exterior space. For this the graph is tree-like and bushy with the undetached part 7 levels deep from the outside. The detached parts however are just 3 levels deep.

Built of *tubali* blocks at the turn of the century, the house has a circular entrance hall with a magnificent baka vault roof . True to the tradition of a Hausa life cycle, the house has undergone several changes as a result of births, marriages deaths and changes of fortune. Unfortunately it was not possible to chronicle these changes with any certainty. Currently there are 56 persons living in its 8 sections., giving a mean of 7 persons per section.

House 157 (**Figure 5.23b**) is the residence of the ward head. The main means of livelihood of the 8 families in house is tailoring. It has a population of 62 persons, the highest in the houses surveyed. Like the previous house it was also constructed of *tubali* blocks probably at the turn of the century, but unlike the previous house it is not as well kept . In addition it lacks an imposing entrance hall (*zaure*) and its 4 sections are not as well defined. The most interesting difference between this and the previous house is that the number of females engaged in the family trade far exceeds the number of males. Thus we have a good example of a house that is both a residence and a work place. The males work in the outer room (the *shago*) and the entrance

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108 plural *sassa*; also called *waje* , plural *wajaje*

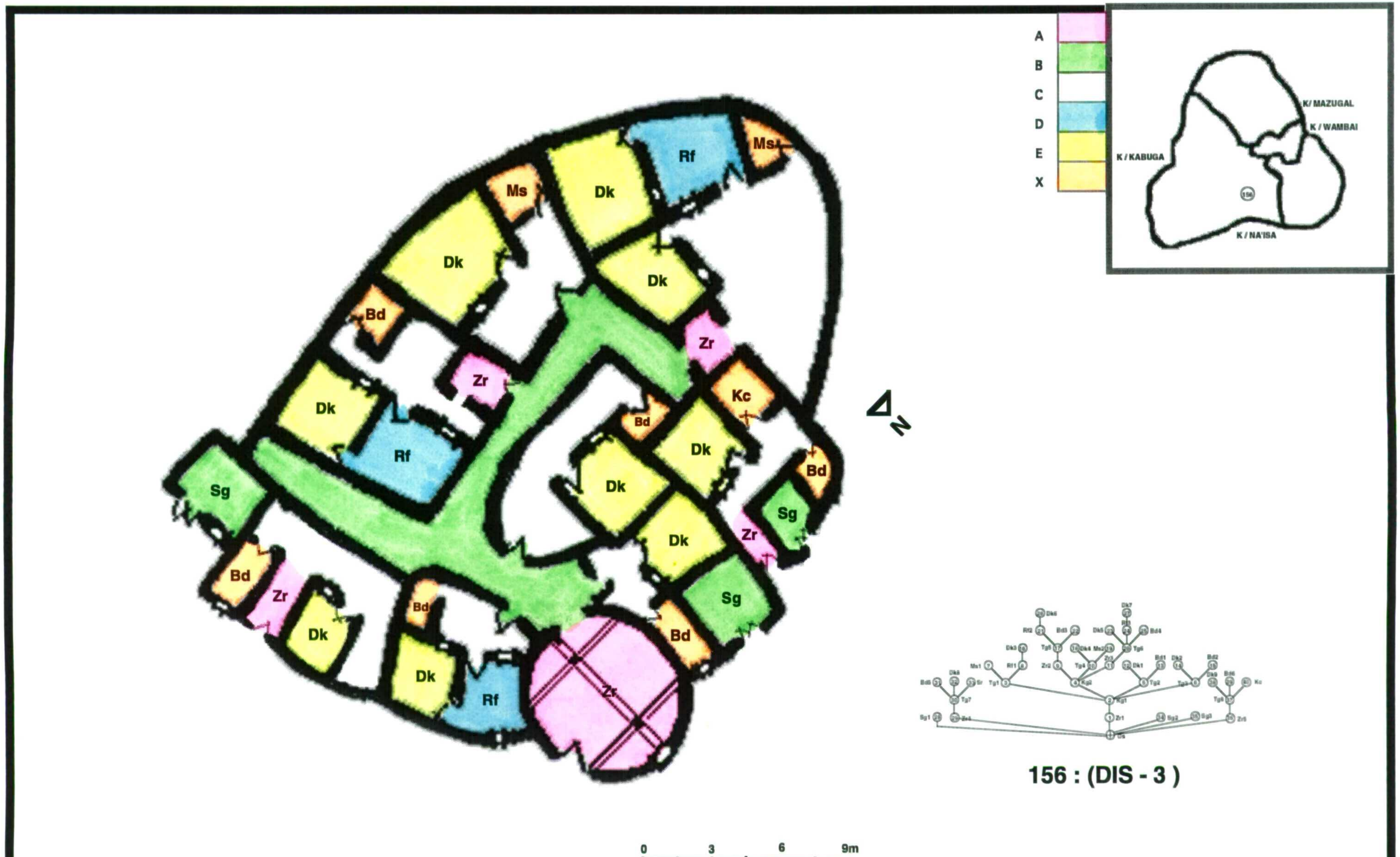

FIGURE 5.23a: EIGHT FAMILY; 40 - 45 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl) B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr); C : Tsakar gida (Tg); Sarari (Sr) D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg) X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

FIGURE 5.23b : EIGHT FAMILY 40 - 45 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)

B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);

C : Tsakar gida (Tg); Sarari (Sr)

D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)

E : Daki (Dk); Shago (Sg)

X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

hall (the *zaure*) . The females on the other hand work mainly in the courtyard and the outer room (the *rumfa*).

Syntactically it has a justified graph which is tree-like and bushy. It exhibits an external ring which is trivial. Like the previous house it is 7 levels deep from the outside.

House 158 (**Figure 5.23c**) is strictly speaking not a Big House for two reasons. First it has no well defined sections, but more importantly for the simple fact that its rooms are all rented. It has been a rooming house since the early 1960's and currently it has a population of 45 persons. Although among the houses surveyed there are quite a few houses with the odd tenant , it is the only other house, aside from **House 139**, whose inhabitants are all tenants and not in any way related. It is also the only house among those surveyed which started not as dwelling place.

It is reported [109] that when the first colonial administration was fully established in 1904, the need arose for a place to separate minor offenders from the more serious offenders. The king granted one of his many stables to the administration which was converted into a small detention yard by building an array of rooms to accommodate the detainees. When the new Native Authority (NA) prison was constructed in the 1930's the yard was converted into a storage place for some of the kings bric-a-brac. It was not until the accession of King Sunusi in 1953 that the place was handed back to the descendants of the stable keepers. The layout of the detention yard has been retained as can be seen from the fact that the house has only 2 inner halls (the *rumfa*) compared to 11 in the preceding house which is of similar size.

Syntactically it is also similar to the preceding house. Its justified graph is tree-like and bushy and it exhibits an internal ring which is trivial. However with a depth level of 9 it is much deeper than the preceding house.

House 159 (**Figure 5.23d**) is in many respects similar to House 157. It dates from the turn of the century and was set up by a wealthy farmer and slave owner. Its proximity to the Kurmi market is probably the main reason why nowadays most of the adult men and women are engaged in one form of trading or another. Like House 157 it was also constructed of *tubali* blocks. Its 6 sections accommodate a population of 47 persons all inter-related. The oldest member of the family agreed that in the last 50 years there had been many changes within its perimeter wall.

Syntactically its a justified graph is tree-like and bushy, and it is 9 levels deep from the outside. It exhibits an internal ring which is trivial.

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109 Interview with Mallam Uba na Alhaji Sule Tarna and the Koki ward head, *maiunguwa* Alhaji Ahmadi 31 July 1994.

FIGURE 5.23c: EIGHT FAMILY; 40 - 45 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
E : Daki (Dk); Shago (Sg)
B : Kofar Gida (Kg); Shago (Sg) ;Turaka (Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D: Rumfa (Rf); Falo (Fl) ; Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk) Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St); Gareji (Gr)

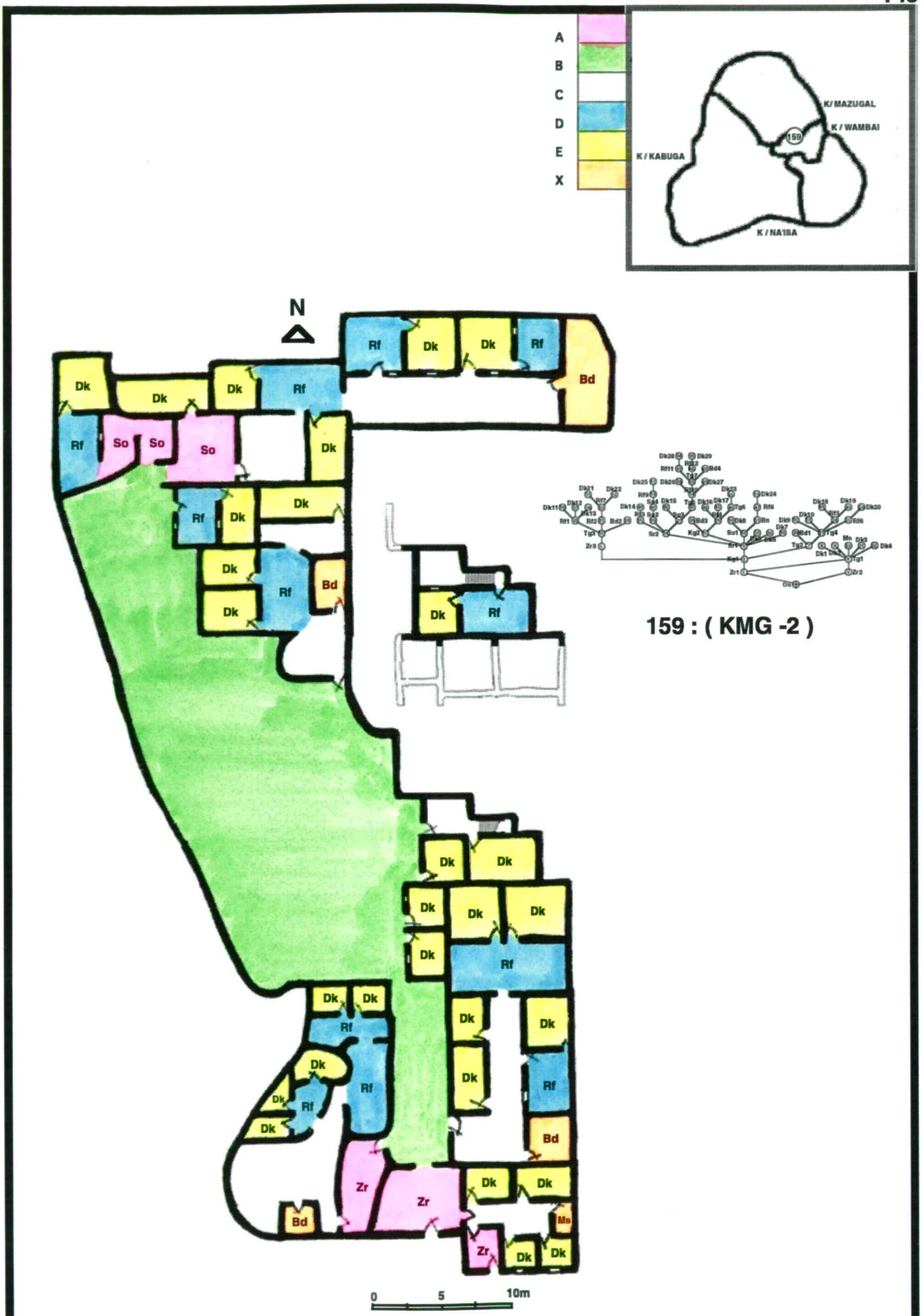

FIGURE 5.23d : EIGHT FAMILY (RINGY) ; > 60 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
B : Kofar Gida (Kg);Shago (Sg); Turaka(Tr); Sarari (Sr);
C : Tsakar gida (Tg); Sarari (Sr)
D : Rumfa (Rf); Falo (Fl); Kwatashe (Kw)
E : Daki (Dk); Shago (Sg)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk)
Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St) ; Gareji (Gr)

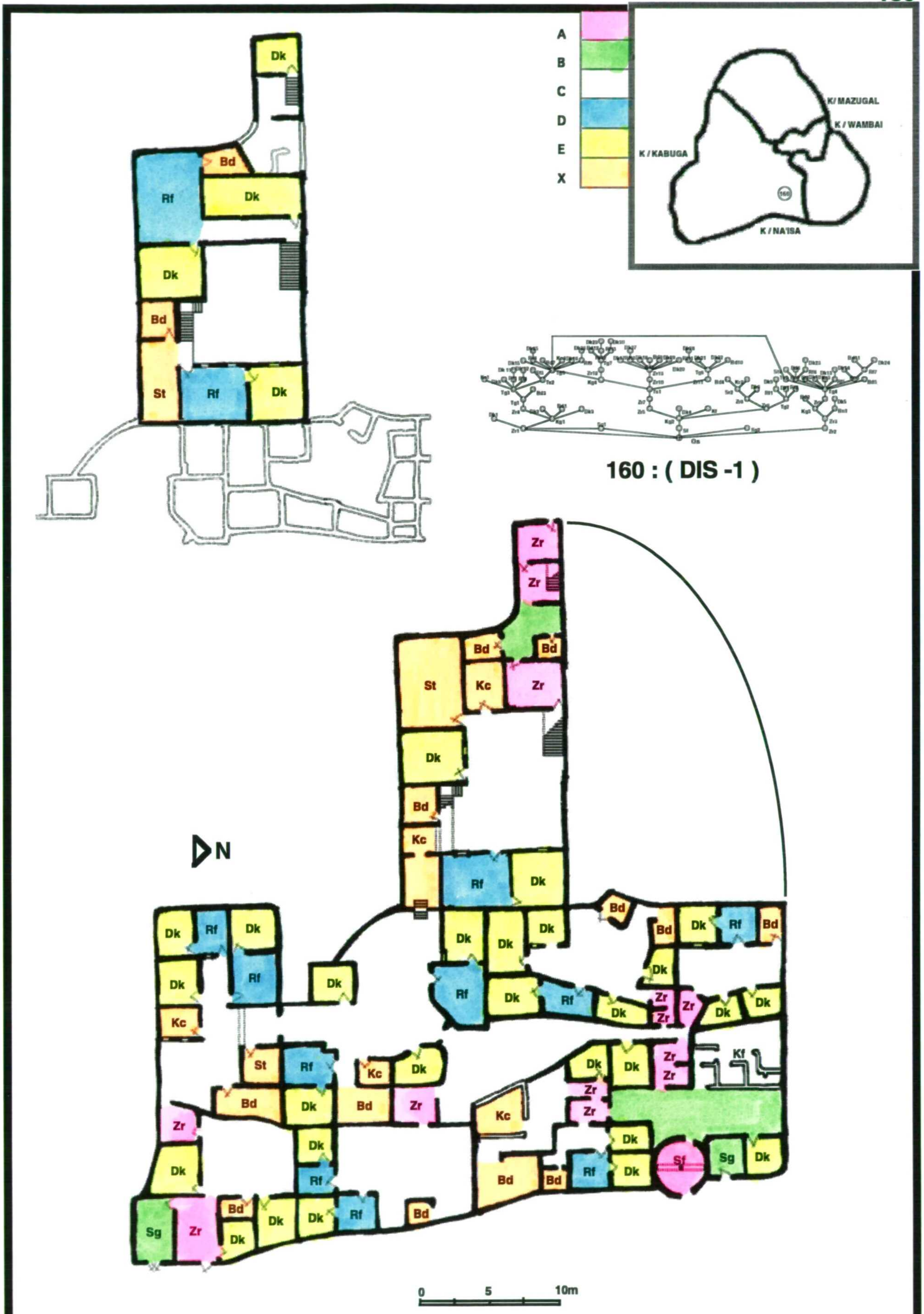

FIGURE 5.23e: EIGHT FAMILY (RINGY); > 90 K - Spaces

A : Zaure (Zr); Soro (So); Shigifa (Sf); Kudandan (Kd); Farfajiya(Fr); Dakali (Dl)
C : Tsakar gida (Tg); Sarari (Sr)
E : Daki (Dk); Shago (Sg)

B : Kofar Gida (Kg);Shago (Sg); Turaka(Tr); Sarari (Sr);
D : Rumfa (Rf); Falo (Fl); Kwatashe (Kw)
X : Bandaki (Bd); Masai (Ms); Shadda(Sd); Mawanka(Wk)
Kicin (Kc); Madafi (Md); Dakin girki (Dg); Sito (St) ; Gareji (Gr)

House 160 (**Figure 5.23e**) belongs to the family of a once minor court official who moved to the area in the aftermath of the Usman Ɗan Fodio Jihad (1804 - 1808). It used to cover almost the entire block when it was first constructed , but some parts have been sold and others were granted[110]. Currently it has a population of 58 persons. In construction , structure and family composition it exhibits all the characteristics of a "Big House". The presence of collapsed and abandoned sections attests to the changes that the house has undergone. With 98 K-sps it is syntactically the largest and the deepest house in the survey. Like the other "Big Houses" its justified graph is also tree-like and bushy. Its ring which connects one part with the main house is internal and non-trivial. Despite the fact that it exhibits all the characteristics of a "Big" house its sections could with very little modification exist independently.

5.9 Summary

Looking at the 160 houses as a set certain salient features become evident. First of all, Houses forming the sample come in various syntactic sizes, however the mean size is in the region of 10 -20 convex functional spaces (K-sps). Broadly speaking, as the number of K-sps increases so does the number of families accommodated although there is no direct relationship.

Secondly, certain space types are found in every house regardless of its size, location or the income group it belongs to. These spaces are the entrance hall (*zaure*) , the courtyard (*tsakar gida*) , the room (*ɗaki*) .These three spaces, *zaure* , courtyard and *ɗaki* together with a function-specific service space, the *banɗaki* or toilet, are found in every house in the sample. They constitute what may spatially be termed 'universals'. In simple terms no house is fully constituted if any one of these spaces is missing. The number , shape and sizes of these spaces vary and there is need to go into certain aspects of the house in detail before a definitive statement could be made about these (See infra **Chapters 6 -8**). Generally however, the number of these spaces in a house has a closer relation to the number of families in the house, whereas their sizes relate more to the income group they belong to than to anything else. Shape on the other hand, quite expectedly relates to the construction components and methods.

There are three other basic space types in the house, namely the outer yard (*ƙofar gida*), the inner hall (*rumfa*) and the kitchen (ɗakin *girki*) . These are not 'universals', in that there are many houses in the sample that are without one or even all of these spaces . To be precise, of the 160 houses only 52 have *ƙofar gida* or outer yard, while 139 have *rumfa* or inner hall.

Thirdly, the number of families accommodated per house vary from a single family up to 8 families; there are even 3 houses with no families at all. Most of the houses though are single family , single storey dwellings. The number of persons per house ranges from the anomalous single person to 62 persons, but overall the mean number of persons per house is 13. Generally

110Although members of the family did not admit it , it is suspected that one of the reasons for spliting parts of the house is inheritence dispute.

however, the number of persons in a house relates more to the number of families in the house than to anything else.

Fourthly, these houses as spatial systems, prima-facie exhibit certain syntactic peculiarities. All the houses have tree-like justified graphs, varying from the bushy and flat to the deep and vertical. Generally however the more the number of families accommodated in a house the flatter and broader its justified graph is. This could perhaps be attributed to the tendency of the Hausa to have sections within the larger houses. Thus it is not surprising to find all the " Big Houses' having flat and bushy justified graphs.

Quite a significant number of the justified graphs exhibit 'rings', most of them external and trivial. These rings are not affected by how deep the house is from the exterior. In addition, up to 25- 30 K-spaces the depth of the house from the exterior, i.e. how deep the house is seems to be a function of the number of K-Spaces. However beyond 30 K-spaces the depth of the houses is generally between 7 and 9 levels deep. One thing that comes across clearly is that despite many syntactic similarities no two houses are the same in shape and size, attesting to their individuality.

Fifthly, from the data gathered it was not possible to make categorical statements about the ages of most of the houses in the sample. However there is no denying the fact that while most of the houses were constructed in the last 50 or so years, quite a few are of considerable age .

Finally some of the houses came into being as a result of splitting , that is a house is split between siblings at the demise of their father. Where they are not wholly split then houses may share certain spaces, for instance the entrance hall (*zaure*), thus becoming what was termed two-tier houses.

The next 3 chapters will proceed to explore these and other features of the surveyed houses in more detail. The aim is to build a database which can be statistically analysed in order to address the major questions set out in the introduction, to wit the establishment of, the spatial morphology that defines the Hausa house and its sub-cultural variations if any; the relationship between spatial patterns and quotidian space use ; and the socio-cultural factors that could account for the persistence and resilience or otherwise of the Hausa spatial patterns.

CHAPTER SIX : PHYSICAL ASPECTS OF THE HOUSE

6.1 General

In the preceding chapter the surveyed houses were introduced in general terms. Three aspects were touched upon namely, family size and population, syntactic size and depth and the period of construction. These represent the social, the configurational and the physical aspects of the houses respectively. In order to establish the basic characteristics of Hausa domestic architecture, one of the objectives of this study (supra **§ 2.4**), there is a need to examine these aspects in detail. This chapter will deal with the most obvious and easily perceptible of these aspects, i.e. the physical aspects of the Hausa house.

The purely physical aspects of Hausa Architecture have received more scholarly attention than any other. Details of building materials (Foyle 1959; Moughtin 1985), construction (Sa'ad 1981), roofing (Daldy 1945), finishing (Dmochowski 1990) and decoration (Kirk-Green 1963) covering the whole of Hausaland, have been enunciated by various scholars. Even the nature and character of the Hausa professional builder, the *magini*, have been more than adequately enquired into (Sa'ad 1981). Thus there is little need to go into these aspects here, except where it becomes necessary to illustrate or elaborate on some aspect of Hausa architecture. What is important here are those features which are peculiar to the individual domestic house.

Several characteristics contribute towards the physical aspect of the house. The details to be enquired here are first, the age of the houses. Secondly, what are the houses constructed of, that is what components and methods of construction were used in realising the structure of these houses ? Next, what is the nature and magnitude of the spatial dimensions, that is, how much space is available within each house and how is it distributed ? And finally what is the ratio of the open to built-up space ? The response to these questions will be looked into and elaborated upon in detail . The first question, that is the age of the houses, has already been touched upon in the preceding chapter. It will be further discussed here.

The procedure employed in the following analysis is to first look at the data in general terms, that is information collected on all the houses is examined as a whole without any differentiation. The houses are then differentiated and examined by the number of families in the house and by their geographical location, that is the data is analysed sector by sector based on the 4 city sectors (supra **§ 3.3**). It is believed that this way any peculiarity resulting from size or location will be highlighted.

6.2 House Construction : How And When

The 160 houses surveyed could be grouped into 4 broad physical types. These are,

- Houses built entirely of the traditional Hausa hand-moulded brick, the *tubali* and roofed using *azara* , that is deleb palm rafters, for instance **Houses 27, 35, 42 & 110 (Figure 6.1)** . Some of the oldest houses are of this type, but so are some recent houses that belong to the indigent .

- Houses built of *burgi,* that is bricks made using a rectangular or square mould, and roofed either with *azara* or corrugated iron sheets, for example **Houses 68, 71, 102, & 131 (Figure 6.2)**. Most of these type of houses were constructed in colonial and post-colonial times. In recent times this type of wall construction has become more prevalent than tubali construction not only because it is more fashionable but, perhaps more importantly because it requires less skill than *tubali* construction

- Houses built with concrete or more appropriately, sandcrete blocks and roofed with corrugated iron sheets, for example **Houses 80, 86 & 98 (Figure 6.3)** . Until the economic boom of the 1970's this type of construction was mostly favoured by the *saraki* (the royalty) or the *tajirai* (the rich merchants). Interestingly houses built this way were usually secondary or tertiary, rather than primary houses. In other words they were houses that were constructed to accommodate a recent bride or a favourite second wife, while still retaining a family house. This and the fact that they were comparatively more expensive meant that they were usually comparatively smaller.

- Houses initially constructed with *tubali* or *burgi,*[111] but for one reason or another have certain parts replaced or reconstructed with sandcrete blocks and roofed with corrugated iron sheets (**Figure 6.4**). **Houses 41, 147 & 160** are good examples of such houses.

An attempt was made while conducting field work to distinguish between houses built with *tubali* and those built with *burgi,* a technology most certainly made popular, if not introduced by the colonial government (See Daldy 1945). However the figure presented for this type of construction should be treated with caution as it is based more on observation than a proper or full constructional survey.

Table 6.1 is a summary of the data on wall construction and roofing by type for the houses in the considered as a whole and also differentiated by sector . This has been extracted from the responses to the questionnaires (**Appendices 3-5**) administered to the inhabitants of each

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[111] Aside from the way they are moulded there is little or no difference between a *tubali* and a *burgi* since both are sun-dried. The Hausa unlike the Kanuri to the east, never learned to fire their bricks even though they fire their pottery.

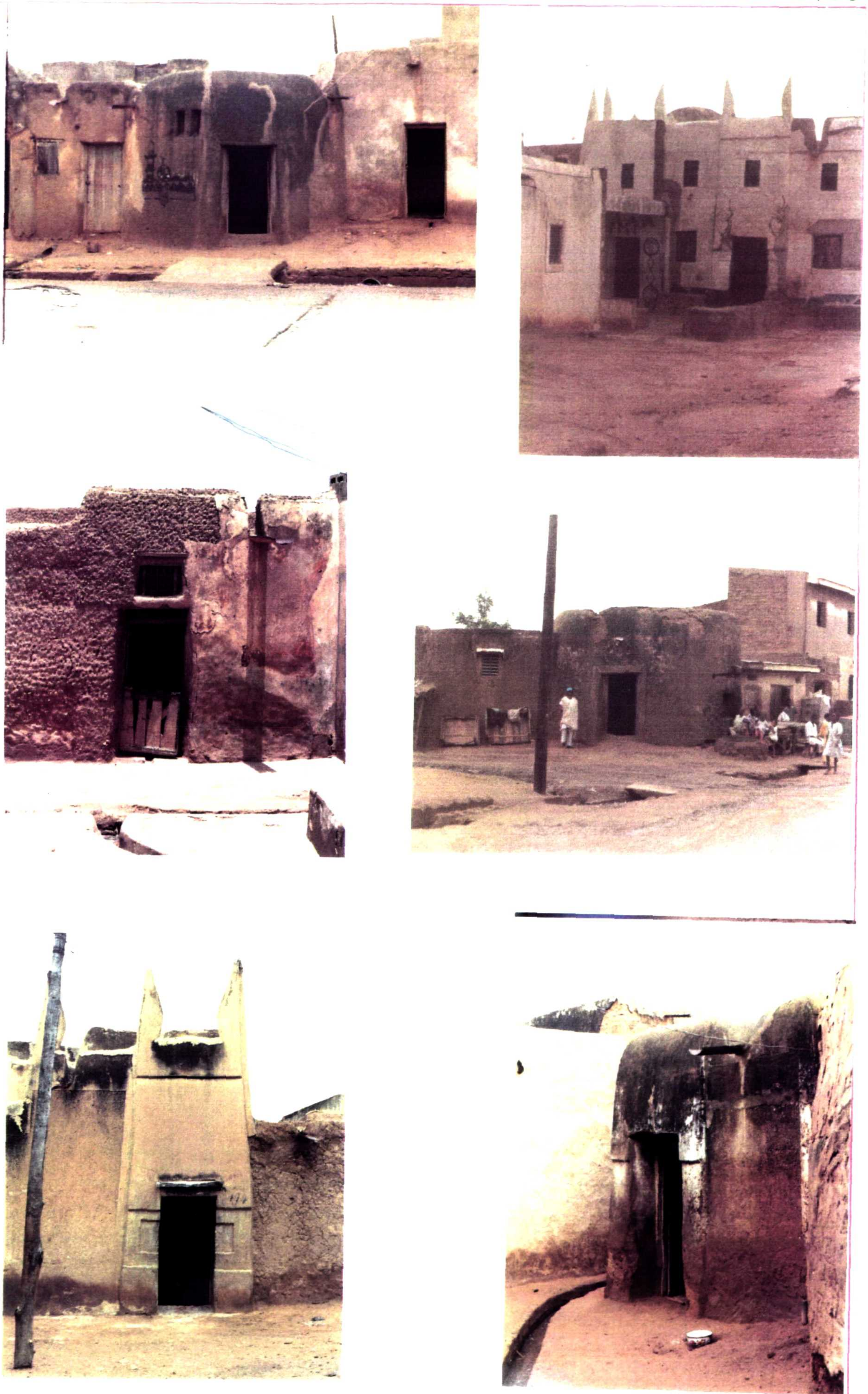


FIGURE 6.1 : HOUSES BUILT OF *TUBALI* AND *AZARA*

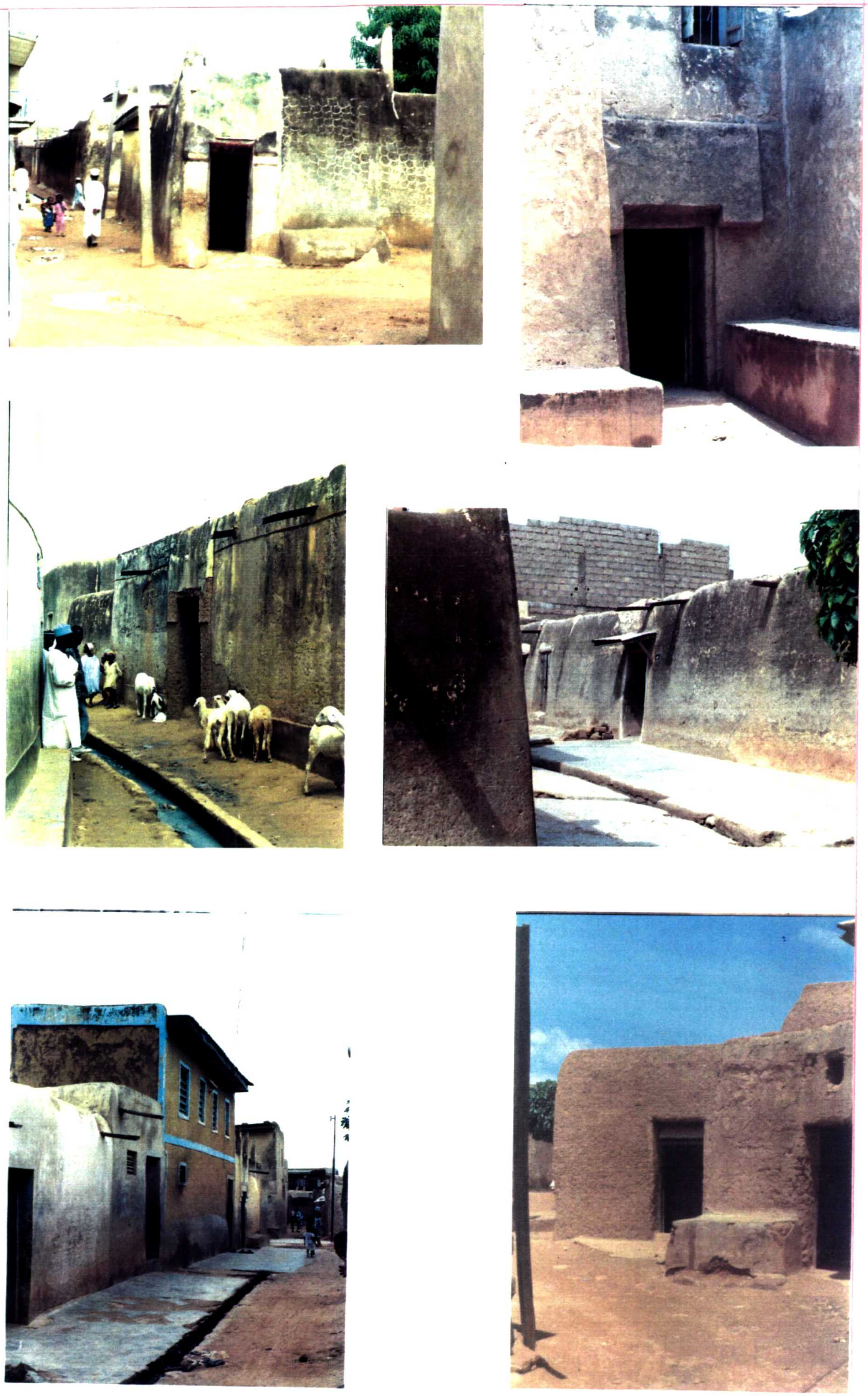
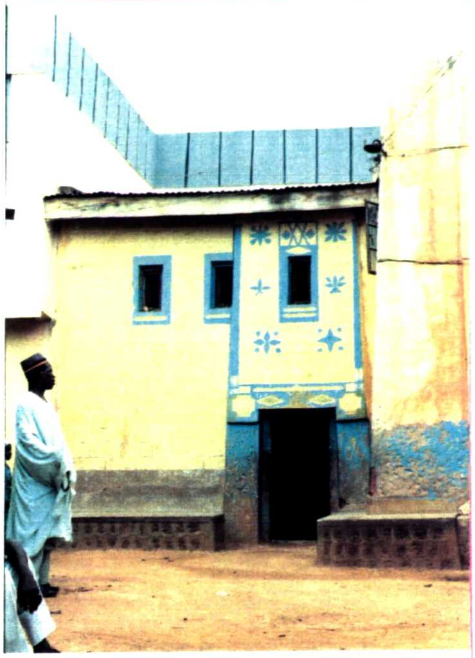
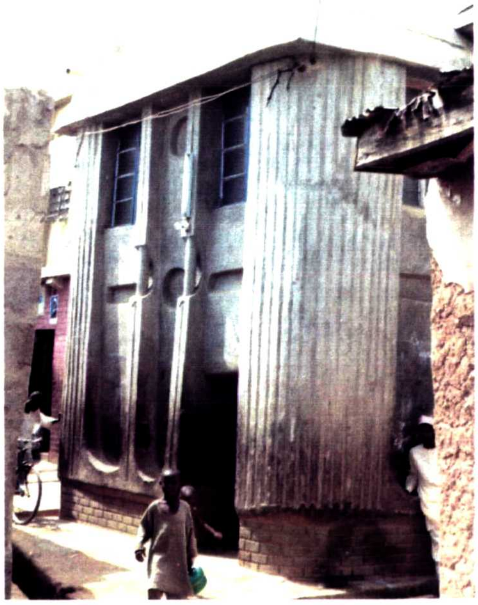
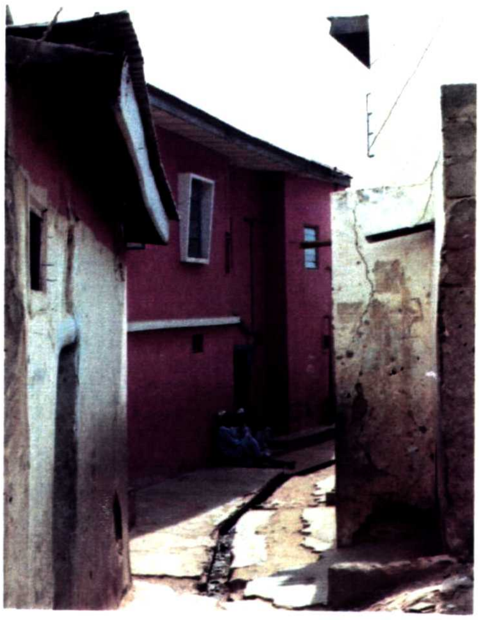


FIGURE 6.2 : HOUSES BUILT OF *BURGI*







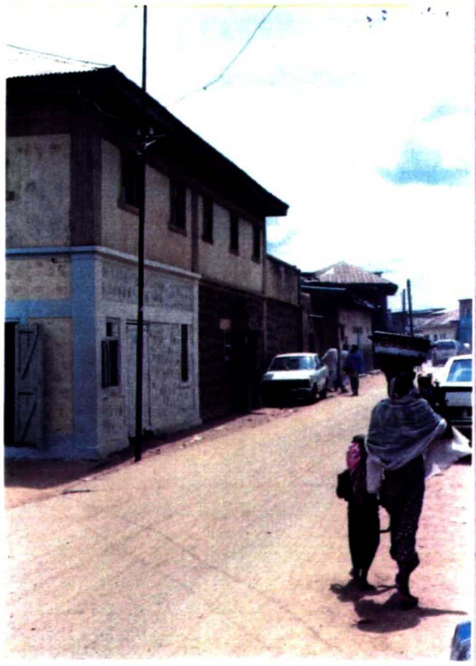


FIGURE 6.3 : HOUSES BUILT OF CONCRETE

FIGURE 6.4 : HOUSES OF MIXED CONSTRUCTION

each and every house surveyed . This table brings out clearly the physical nature and condition of the surveyed houses. First, about 85 % of the houses are wholly constructed with adobe, on an approximate *tubali* to *burgi* ratio of 3 : 2 . At the other end of the scale only 7.5 % of the total houses were constructed wholly with concrete blocks.

The table also shows about 80% of the houses are finished with cement screed plaster regardless of the type of brick used for construction, be it *tubali* or *burgi* [112]. However only about 4% of the houses built with adobe are finished with cob plaster, the traditional wall finish. In some cases cob plaster is treated with a water proofing material called *makuba* [113] making such a house aesthetically most appealing (**Figure 6.5**). On the other hand all concrete block houses are finished with a cement plaster. Houses of mixed construction quite expectedly have finishes commensurate with their construction materials.

Similarly, a little more than half of all the houses were roofed with *azara* , but only about 16% of the houses are roofed wholly with corrugated iron sheets. The remaining houses which constitute just under one-third of the total have mixed roofing, that is some parts are roofed with corrugated iron sheets and other parts with *azara* .

TABLE 6.1: SAMPLE HOUSE CONSTRUCTION

Category	Construction				Finish				Roof		
	Adobe %		Concr	Mixd	Cem. Scr.	Cob	Cem. Plast.	Mixd	*Azara*	Corr. Iron	Mixd
	Tubali	*Burgi*	%	%	%		%	%	%	%	%
Sample (N=160)	51.25	33.12	7.500	8.130	80.63	3.750	7.500	5.000	52.50	16.25	31.25
North (N=35)	42.86	51.42	2.860	2.860	91.43	-	2.860	5.710	74.29	8.570	17.14
East (N=55)	60.00	21.82	12.73	5.450	87.27	-	12.73	-	52.72	23.64	23.64
South (N=40)	45.00	32.50	7.500	15.00	67.50	7.500	7.500	17.50	32.50	17.50	50.00
West (N=30)	53.33	33.33	3.340	10.00	73.33	10.00	3.340	13.33	53.33	10.00	36.67

Examining the data sector wise shows the same pattern in construction, roofing and wall finishing. In other words in every sector adobe construction, *azara* roofing and cement-screed finishing seem to be in the majority. However there are also individual differences. Thus the north sector has the highest percentage of the houses built in adobe walls and finished with cement

[112]Houses built with *burgi* are usually though not always, more acutely linear than those built with *tubali*. In addition their walls tend to have comparatively more uniform thickness as opposed to *tubali* walls that taper rather acutely at the top. In a few cases the wall finish has been eroded enough by weathering for the construction bricks to show.

[113]***Makuba*** is made by seeping the seeds of the locust bean tree and used to treat walls and roofs. High concentrates of it are also used to polish floors (Daldy 1945; Moughtin 1985).

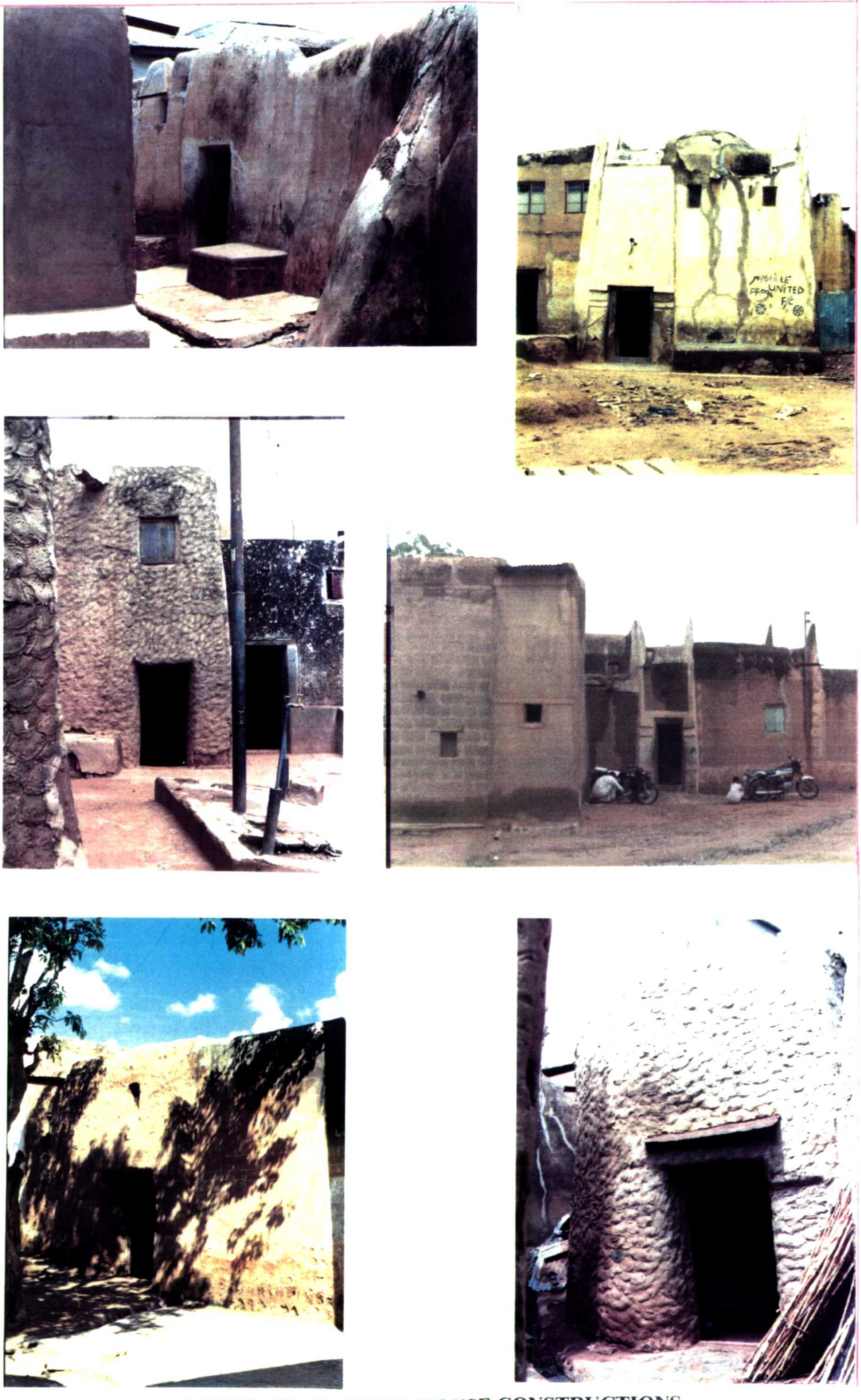


FIGURE 6.5a :VARIOUS HOUSE CONSTRUCTIONS

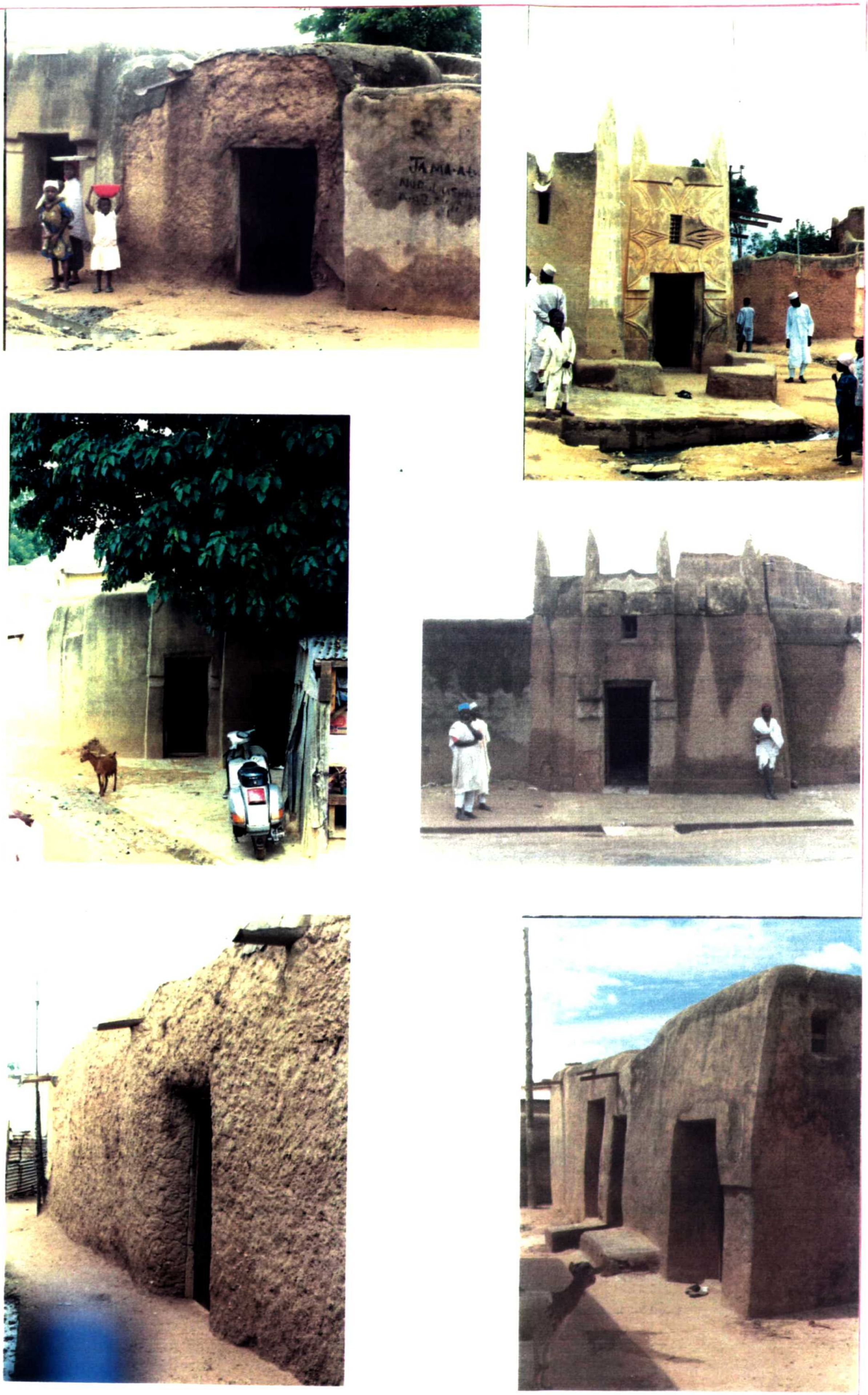


FIGURE 6.5b :VARIOUS HOUSE CONSTRUCTIONS

screed. Not surprisingly, it also has the highest percentage of houses roofed with *azara*. The east sector has the highest number of the houses built in concrete, which as we noted are all finished with cement plaster. It is in this sector too, that one sees the highest percentage of the houses roofed entirely with corrugated iron sheets. Finally the south sector has the highest percentage of the houses with mixed construct ion, roofing and wall finishing.

This pattern of construction, roofing and wall finishing still persists when the houses are differentiated by family size. This is immediately obvious from an examination of **Table 6.2** which summarises the construction characteristics of the houses by family size. The figures shown are the respective unit numbers. For instance of the 103 single family houses 54 are constructed of *tubali* a and 30 of *burgi* making a total of 84 houses constructed of adobe.

TABLE 6.2: HOUSE CONSTRUCTION TYPE BY FAMILY SIZE

Category	Construction				Finish				Roof		
	Adobe No.		Concr	Mixd	Cem. Scr.	Cob	Cem. Plast.	Mixd	*Azara*	Corr. Iron	Mixd
	Tubali	*Burgi*	No.	No.	No.	No.	No.	No.	No.	No.	No.
≤ 1Family (N=103)	54	30	11	8	82	2	11	8	47	21	35
2 Family (N=31)	15	16	-	-	26	3	-	2	24	2	5
3 Family (N=8)	5	2	1	-	7	-	1	-	4	3	1
4 Family (N=9)	3	3	-	3	7		-	2	5	-	4
≥5 Family (N=9)	5	2	-	2	7	1	-	1	4	-	5
Total (N=160)	82	53	12	13	129	6	12	13	84	26	50

What this table highlights is the fact that almost all the houses built with concrete blocks are single family houses. Only one multiple family house is built with concrete and this is **House 139** which, as we noted earlier (supra **§ 5.5**), is a rooming house. Again as is the case with construction the bulk of the houses roofed with corrugated sheets are single family houses.

There are two possible explanations for this observation. The first is that single family houses are smaller and hence easier to construct, and the second and more important reason is that multiple family houses are not well disposed to any major change due to joint rather than singular ownership.

However it is not uncommon to have some parts or even a section in a multiple family house reconstructed with concrete. Thus as the table shows, one-third of the houses with mixed construction, that is partly built with adobe and partly with concrete are multiple-family houses.

From the foregoing it is clearly apparent that the indigenous way of construction still prevails [114], albeit with modifications, but much less so in the case of roof construction than in the case of wall construction. There could be, perhaps two explanations for this; one is that the inhabitants of Kano find the indigenous mode of construction satisfactory; the other is that they have little or no choice perhaps, because the cost of the so called 'modern construction materials', i.e. concrete blocks and metal roofing sheets, is prohibitive enough to prevent their widespread use.

There are elements of truth in both statements. As we shall see later (vide infra **Chapter 7**) most of the respondents to the questions on house perception were not averse to the indigenous building material per se, on the contrary not quite a few eulogised it [115] , but rather the main objection was in the time and labour, necessary to maintain walls and roof structures built this way, in good condition.

The method of plastering adobe walls with cement screed provides a simple and reasonably affordable, even though not an ever-lasting solution [116], to the problem of wall weathering and denudation. In addition this solution does not require an extra special skill, and above all it does not compromise any of the socio-cultural conceptions of a house or dwelling place. Hence the widespread use of this method of construction.

The case of roofing is altogether a different matter. First of all, roofing is a costly affair, constituting anything between 25% to 45% of the construction cost. Secondly the timber framing and the laying and fixing of metal sheets requires a skill that most of the indigenous builders lacked during colonial and even early post-colonial period. This required employing someone, almost invariably an artisan from the southern part of the country, to do that. Thus the indigenous method of construction, where one can seek the help of the kith and kin to assist the master mason with labour, became untenable. Above all the use of this type of roofing meant that certain socio - cultural traits are compromised. These include the size of the *zaure*, the aesthetic appeal and thermal comfort of the interior of the building, and the problem of joining at the intersection of shared walls. Despite these problems, many an average man of means has gone the DIY way (i.e. Do-It-Yourself), with the likely risk of doing a shoddy job, and encountering more problems than otherwise.

One popular way to solve this perennial problem of roof maintenance was to roof the house piece - meal. This type of roofing accounts for about one -third of the roofs in the entire sample. In this way, the cost of roofing can be spread over time, and if necessary professionals could be

[114] This supports Sa'ad's statement (1989:72) that, " quite a substantial percentage of dwellings within Kano walled city are still based on traditional models."

[115] In one embarrassing but amusing incidence, one *maigida* attributed his declining virility, and the subsequent break-up of his penultimate marriage to sleeping in rooms constructed of concrete blocks. When it was pointed out that his latest marriage was still intact, he opined that it was just a matter of time.

[116] The problem with this type of construction is that of bonding between cement screed and mud wall, due to differential curing, and subsequent expansion and contraction as a result of moisture intake. Even in the best of cases this solution rarely exceeds 10 years without a need for new plastering.

employed to construct the important parts of the house, while the other parts are either left alone or roofed the DIY way. Thus except for the really wealthy, roofing using 'modern construction materials', although preferred by many, has not been a very viable option. In sum the dominant form of roof still remains the *azara* construction; the flat roof variant dominating over the *baka* variant.

As noted earlier (vide supra **Chapters 5**), it was not possible from the data gathered to make categorical statements about the ages of most of the houses in the sample. There were many claims as to the ages of the houses. While some were certainly wild and highly improbable, many seemed reasonable enough although they could not be substantiated. There are perhaps four reasons for this, one relating to the materials used to construct the houses, others relating to certain socio-cultural disposition; First, as Sa'ad (1986:105) rightly pointed out, " the pervious nature of mud as a building material leaves us little evidence for historical reconstruction..." Secondly, until the advent of colonialism and the consequent changes in land tenure laws, rules and regulations, domestic buildings did not have 'fixed' sizes though they may have fixed perimeters[117]. Houses grew and retracted in size as need arose (Schwerdtfeger 1971&1982). Thirdly, the Islamic rules of inheritance, which the Hausa strictly endorse, sometimes necessitate the break up of houses into smaller units which could not exist as separate entities without, sometimes radical, modifications. Finally, unlike the Waje area, no records regarding the construction or modifications of houses inside the *Birni* or Walled City, were ever kept by any authority , colonial or otherwise.

Despite these facts, one statement could be made about the ages of the houses, and that is most of the houses in the sample were constructed during the colonial era, especially the period between the two World Wars, that is 1918 and 1939. This was arrived at by comparing the characteristics of those houses whose ages could definitely be established, with those whose given ages were in doubt, or outright rejected. Evidence was looked for in the way the houses were constructed - for instance the use of moulded mud bricks; building components - for example door jambs, window frames etc.; and finishes and decorations - for instance the use of simple surface etchings predates the use of mud plaster (Logan 1929:403-404; Schwerdtfeger 1982: 299) with and without painting , which in turn predates the use of cement grout and modern paints (Sa'ad 1989:72). This is not to say that where these houses stand now, were empty fields before; most definitely not. What is meant is that most of the houses surveyed, took their present shape and characteristics, most probably during this period. However there were exceptions, i.e. houses that were definitely constructed in pre-colonial times, for instance **Houses 23 & 156** , and of course others that were constructed in post colonial or contemporary times, for instance **Houses 101 & 139** .

Another reason that could be presented in support of this observation is the fact that this was the period when the Kano economy was transformed into a market economy through colonial policies.

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[117]Even that is sometimes fluid rather than fixed, especially in rural and semi-urban settlements.

This was also the time when the British Overrule reached its zenith (Fika 1972; Hogendorn 1978 ; Shenton 1981)[118].

6.3 Space Provision And Allocation

Space as a social concept could be resolved into three ideational constructs, namely ecological space, structural space and the more concrete physical space . While ecological space deals with natural resources and the, " relation between communities in terms of densities and distribution," structural space deals with the relations " between groups of persons in a social system expressed in terms of values" (Radcliffe-Brown 1940: 109-110). Aspects of both types of space have been touched upon above, and it is on physical space that this section focuses .

Physical space is the point of convergence of two well known theories of space; territoriality and proxemics (Newman 1972; Hall 1959 & 1966). The former is principally concerned with control of space for the territorial satisfaction of identity, security and stimulation. The latter with non-verbal human action and reaction in the use of personal and corporeal space," as a specialised elaboration of culture" (Hall 1966:103). However in their essentials these are complimentary and in many cases overlapping, rather than two distinct ideas dealing with the human to human behaviour in space (Porteus 1976:385).

Home or the individual house, as the focus of intense personal and interpersonal activities, for example, living, procreation, socialising etc., is identified with a specific and in most cultures, finite physical space. This, and the fact that of all the ideational constructs of social space, physical space is the one most amenable to measurement, have been the reasons why it is indicated in several socio-cultural parameters.

An argument could be constructed in the following manner: certain biological needs require physical space in order to be satisfied, and the minimum space needed is that which is necessary for individual physical and more especially, psychic health. Therefore a degree of fit between the magnitude of space in, say a house, and the functions that the space serves, is to be expected. So also the size of the group, for instance the family inhabiting it. Similar arguments could be made from the economic and the sociological points of view etc., relating the size of space to the wealth, status and customs of the users of space etc. Thus Naroll (1962) posits that the total floor area and the population of a settlement form an *allometric* pair [119]. Similarly Ember (1973) and Divale (1977) correlated floor area to marital residence, while David (1971) correlated the number of adult inhabitants in a Fulani compound with the number of huts, which in turn is partly related to the area of the compound.

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[118]Hogendorn (1978:134) opines that one of the most obvious and lasting effect of the great groundnut boom was to be found in the number and style of constructions in places like Kano.

[119]An *allometric pair* is ," a pair of dimensions of an organism or of a social or cultural organisation whose growth or development is related in the form of a log-log regression..." (Naroll 1962 : 587)

Although it could be argued that these authors are archaeologists chiefly concerned with reconstructing the past, the case for the causal relationship between socio-economic factors and physical space as expressed in residential plans, has been made by both architects (Prussin 1979; Schwerdtfeger 1982) and anthropologists (Goody 1958; Glassie 1975). Moreover the argument of causal relationship is equally valid when reversed[120] .

However the problem lies not so much on the acceptance or otherwise of a causal relationship between physical space and certain socio-cultural parameters[121] , the problem lies in determining which of these myriad parameters is dominant, and to what degree does it affect this relationship. This difficulty notwithstanding, the analysis of physical space dimensions serves two main purposes. First, it is a means of illustrating the cultural preference in a given sample without necessarily going into the rationale behind the preference. Secondly, where a sufficient body of data is established it might be possible to use such data for cross-cultural comparisons.

Three aspects of physical space will be discussed in this section. First, what are the physical limits defining the Kano house? Second, given the limits of a discrete domestic space how are the respective functional spaces physically redefined ? Three, what is the ratio of the open to built up space within the complex ? The first aspect tells how much is invested in physical space, the second aspect how physical space is differentiated while the last aspect is concerned with the balance between external and internal physical space.

The analysis that follows is based on the computation of the floor areas of the individual houses, details of which are presented in **Appendix 7**. Data relevant to respective sub-sections is drawn therefrom.

6.3.1 Space Provision

Two aspects of space provision will be examined ; these are the total floor area in a house and the relationship between total floor area and the number of house inhabitants. The magnitude of the total floor area per house shows a wide range across the entire sample. It does not seem to follow any regular pattern. This is evident from an examination of **Table 6.3** which has been extracted from **Appendix 7**. For instance the minimum and maximum unit floor area recorded is 48 m^2 and 2119.84 m^2 respectively. However the mean unit floor area is 255.95 m^2 , with a Standard Deviation value of 241. 79 m^2 and a corresponding Coefficient of Variance of 94.47 % . Similar pattern is observed in the distribution of both the ground floor and the upper floor area. The highest variations are noticed in the magnitudes of the upper floor areas, while the lowest are observed in the magnitudes of the unit floor areas. Thus Standard Deviations for both the unit

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120 Oswald (1987: 295) while discussing this argued, " If we are able to identify causal relationships in the present, then they should be equally applicable to the past and to the future".

121 David (1971: 117) has grouped these parameters into two broad categories; " one determined by the ' facts of life', age, sex, kinship and affinity, the other by ' what life is all about', i.e. wealth, power, job, social position, and so on."

floor area and the ground floor area are almost equivalent to the respective mean area values, while that for the upper floor area is almost twice the mean area value.

Examining the area distribution sector by sector (**Table 6.3**) shows that in spite of this wide variation the respective unit house area means for the four sectors compare well with the unit house area mean for the entire sample. The north and west sectors recorded the minimum mean and the maximum mean floor areas respectively. However the mean area values closest to the sample mean are those recorded for the south and east sectors.

TABLE 6.3: TOTAL AREA DISTRIBUTION PARAMETERS (SAMPLE & SECTORS)

	GROUND FLOOR AREA (m^2)					UPPER FLOOR AREA (m^2)					TOTAL UNIT FLOOR AREA (m^2)				
	Sampl	North	East	South	West	Sampl N=62	North N=14	East N=24	South N=12	West N=12	Sampl	North	East	South	West
Min.	48.00	60.57	56.17	48.00	91.88	4.780	27.80	13.750	31.50	4.780	48.00	70.060	56.170	48.00	97.120
Max.	2076.1	598.39	2076.1	1005	1452.7	250.25	166.80	151.41	250.25	205.32	2119.8	765.19	2119.8	1005	1658
Mean	229.61	186.24	242.39	236.42	245.66	26.17	18.514	24.765	31.633	32.163	255.95	204.75	266.98	268.06	279.16
Std Dev.	228.77	124.38	306.37	157.63	241.41	46.277	35.121	37.453	60.268	51.453	241.79	142.93	308.78	170.72	275.30
Coeff.Var	99.63	66.79	126.39	66.67	98.272	176.83	189.70	151.23	190.52	159.98	94.469	69.807	115.68	63.689	98.618
Kurt.	32.18	3.492	23.140	12.33	19.339	5.919	8.297	2.218	4.540	2.517	28.872	5.565	23.145	6.801	19.493
Skew	5.096	1.933	4.620	3.036	4.364	2.354	2.790	1.685	2.280	1.698	4.774	2.243	4.5174	2.161	4.379

Examining the area distribution by family size shows another kind of pattern (**Table 6.4**). As might be expected, the magnitude of the minimum floor areas closely relates to the number of families in a house; minimum floor area increases with increase in family size. This however, is not the same in the case of the maximum floor areas where glaring differences are discernible in the 3 and 4 family categories. However comparing the respective unit area means for the 5 family categories with 255.949 m^2 , which is the unit area mean for the entire sample, only the 5-and -above family category stands out. The respective figures are 203.60 m^2, 238.75 m^2 213.39 m^2 293.91 m^2, and 932.11 m^2. Thus there is some consistency in the relationship between the total floor area and the size of family . However this relationship is true only for the ground floor and total floor areas but not for the upper floor areas.

TABLE 6.4 : : FAMILY SIZE AREA DISTRIBUTION PARAMETERS

	GROUND FLOOR AREA (m^2)					UPPER FLOOR AREA (m^2)					TOTAL FLOOR AREA (m^2)				
	1 FAM	2 FAM	3 FAM	4 FAM	≥5 FAM	1 FAM	2 FAM	3 FAM	4 FAM	≥5 FAM	1 FAM	2 FAM	3 FAM	4 FAM	≥5 FAM
Min.	48	91.81	91 12	221.1	284 6	4.78	25	26.77	31.5	43 72	48	91.81	166.5	221.1	284.6
Max	450.6	589 4	320 6	440.6	2076	250.3	209.1	81.8	59.86	205.3	538	765 2	320.6	500.5	2120
Mean	176 6	210 7	189.6	279.5	904 4	26.58	28.48	23.77	14 37	27.67	203.6	238.8	213.4	293.9	932.1
Std Dev.	79 68	114 6	68 35	67.81	588	44.16	55.84	36.93	22.80	68.17	99.92	144.6	54.01	86.25	625.5
Coeff Var	45.13	54.37	36 05	24.26	65.01	166.1	196.1	155.4	158.7	247	49.09	60.55	25.31	29.35	67.11
Kurt.	1.498	3.516	.083	1.646	-.354	6.475	3.156	-.882	-.43	3.513	.718	1.948	-.197	1.785	-.613
Skew	1.115	1.921	.708	1 611	848	2.312	2 075	.976	1.058	2.286	.997	4.099	1.006	1.639	.807

What could account for, or what could one infer from these observations, bearing in mind that several factors contribute to determine the dimensions of physical space ? To begin with, the wide variation noted in the distribution of floor area across the sample could be taken as an indication of the low criticality in physical space investment in Hausa culture. However the fact that the mean total floor area is consistent with family size belies this supposition. In addition most of the respective means across the sector and across the 5-family categories approximate the respective sample means. A possible explanation for the wide variation in area across the sample would be the strong presence of what we have termed " Big Houses", all of which are in the 5-and -above family houses. These as we have noted, contain within them considerable fallow space (*sheka*), making it possible to easily add or subtract functional spaces commensurate with the changing family size or arising spatial requirements of the inhabitants. In a sense their sizes are never 'fixed', that is new families continue to be accommodated until a saturation point is reached. Thus it is not accidental that the widest variations are observed in the 5-and -above family houses.

Secondly, the upper storeys found in just over one-third of the houses, exhibit wide variations in area distribution, clearly shown by the high Standard Deviation values, which stand at, on average 1.5 of the mean area value for each family category. This would indicate that perhaps conceptually it is not considered as an integral part of the house in terms of the space availability, but probably only an auxiliary unit attached to the house for any number of reasons. Hence its importance lies in other than the purely functional. This is supported by the lack of congruence between the upper floor area and the family size. In Hausaland the upper storey has invariably been a associated with affluence and prestige. In many cases it serves as a private apartment for the *maigida* (house head) and or his guests and hence it is usually accessible from those parts that are shallow from the outside. If this is correct then the inclusion of the upper floor areas would surely affect the overall pattern of area distribution across the sample . Finally, if it is accepted that availability of availability of land, coupled with low investment in capital and labour necessary for construction could account for higher investment in physical space (David op. cit. :115), then the reverse could also be true. In other words, all things being equal, where land is at premium, and construction costs are high, the tendency is for physical space to be kept to the minimum.

Apparently this argument holds for the Kano social milieu. As we noted Kano has invariably been a highly populated, highly dense urban milieu (supra § 3.1). This, coupled with Kano being the Hausa commercial and cultural centre (Mahadi 1989), makes land to be constantly at a high premium, in a cultural rather than a commercial sense. Consequently construction investments tend to be relatively high. This aside it would seem that a mean physical space of approximately

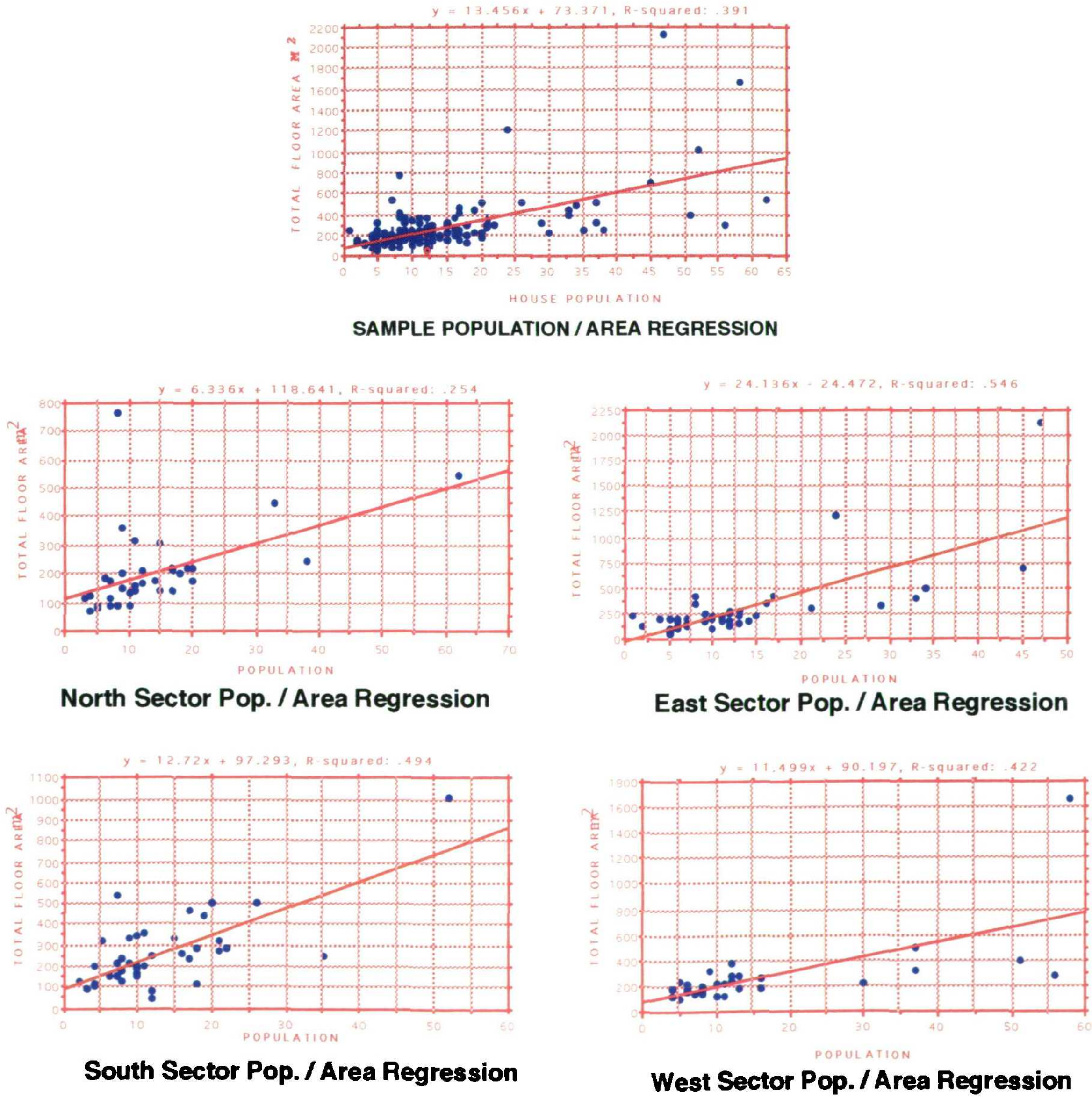

FIGURE 6.6a : SAMPLE AND SECTOR POPULATION / TOTAL AREA REGRESSIONS

$175m^2$ plus 25 m^2 per family per house is indicated for the surveyed sample [122]. Consequently the mean total floor area for a unit house irrespective of the sector would be approximately between $200m^2$ to $250m^2$.

Before closing this sub-section it will be profitable to look at the relationship between the physical space in a house and its occupants' population . **Figure 6.6a** shows the graphs of the total house area plotted against the number of house occupants, first considering the surveyed houses as a whole and then with the houses differentiated by sector.

From this it is seen that the correlation between the number of occupants and the total floor area for the sample as a whole ($R^2 = 0.391$) is comparatively lower than the other sector correlations, except for the north sector. The north sector as we noted above recorded the lowest mean floor area for the ground, upper and total floor areas. Generally then the number of persons in a house relates poorly to its size.

One way of looking at these values is to take them as indices for comparing the whole to its parts. Thus although at the global level the number of occupants poorly predicts the total area of a house, sector wise these correlations could indicate the degree of investment in physical space, where the index of investment is understood to be only the product of land and wealth. Taken this way, the comparatively high regression values seen in the east and south sectors could be attributed to the level of land use optimisation.

Next the houses as differentiated by the 5 family categories are considered (**Figure 6.6b**). The correlation coefficients for the 5 family categories are 0.328, 0.051, 0.418, 0.148 and 0.008 respectively. These figures seem to be not only generally comparatively low but also inconsistent, again implying that the number of occupants in a house poorly predicts the total area of that house. There are two possible explanations for this observation. One is that the overall area of a house usually remains fixed and not normally physically expanded. When a certain critical density is reached new houses are found by the well-off younger generation family members. Secondly, as we have noted (supra **§ 5.3.1.2**) there is however a tendency for houses to be fragmented as a result of inheritance . In fact the more the number of offspring the higher the chances of a house fragmenting after the decease of the *maigida.* Thus it is not accidental that the 5-and-above family category has the lowest regression value. A word of caution though; these figures do not necessarily imply inadequacy of spatial quantity for a given house population, rather the number of persons in a house is not the major determining factor, nor is it obviously the only factor , in the provision of space.

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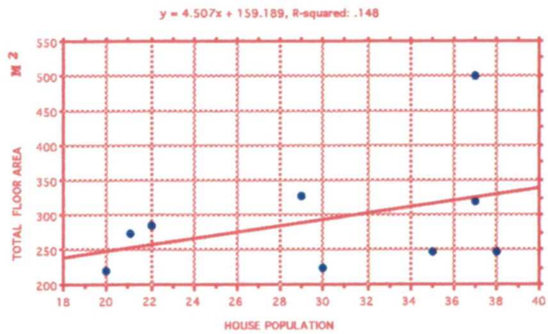
[122]This ignores the anomalous high figure of the "Big Houses" and considers the no family as one family houses. Mathematically the equation for the mean total floor area per family per house is given by **$y = 25.027x + 174.452$**. The regression coefficient (R^2) is 0.624

It is interesting to note glitches in some of the regression graphs. These are the unusual occurrence of some unit houses with low population and large total floor area or vice-versa. Thus in the whole sample regression graph two units stand out; these are **Houses 159 &160**, with population 47 and 58 and unit floor area 2119.84 m^2 and 1658.40 m^2 respectively. Similarly there is a single glitch in the north sector regression graph formed by **House 131** (8 / 765.19 m^2) and triple glitches in the west sector graph formed by **Houses 154, 156 & 160**. The east and south sectors have double glitches formed by **Houses 153** & **159** and **Houses 144** &**155** respectively.

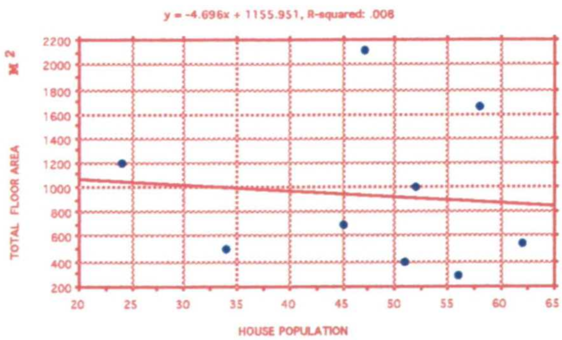
1- FAMILY POPULATION / AREA REGRESSION

2- FAMILY POPULATION / AREA REGRESSION

3- FAMILY POPULATION / AREA REGRESSION



4- FAMILY POPULATION / AREA REGRESSION



≥ 5- FAMILY POPULATION / AREA REGRESSION

FIGURE 6.6b : FAMILY SIZE HOUSE POPULATION / TOTAL AREA REGRESSIONS

TABLE 6.5 : TOTAL FUNCTIONAL SPACE AREAS

Description	TOTAL FUNCTIONAL SPACE AREAS PER HOUSE																								
	ZAURE					COURT					*RUMFA*					*ƊAKI*					ROOM (*Ɗaki* & *Rumfa*)				
	ALL	NORTH	EAST	SOUTH	WEST	ALL	NORTH	EAST	SOUTH	WEST	ALL	NORTH	EAST	SOUTH	WEST	ALL	NORTH	EAST	SOUTH	WEST	ALL	NORTH	EAST	SOUTH	WEST
Minimum (m^2)	3.19	4.490	3.19	4.70	6.64	10.50	12.54	12.92	10.50	21.30	4.400	4.43	4.80	9.00	4.40	6.76	6.78	6.76	8.10	10.14	10.51	10.51	12.02	14 10	15.84
Maximum (m^2)	118.80	118.80	97.03	117.00	111.34	945.58	130.10	945.58	333.80	569.94	246.60	112.76	246.60	149.00	162.16	373.27	143.90	373.27	206.00	308.54	619.87	256.66	619.87	256.00	470.70
Mean (m^2)	**26.10**	**25.24**	**22.24**	**33.82**	**23.75**	**63.56**	**43.93**	**69.77**	**65.29**	**72.81**	**24.58**	**21.43**	**24.59**	**26.97**	**25.06**	**51.15**	**37.21**	**55.12**	**52.60**	**58.19**	**74.84**	**58.64**	**79.71**	**76.00**	**83.25**
Std Dev	20 77	21.13	17 19	25 06	18.14	96.54	33.143	135.61	62.44	98.45	30.68	23.18	35.27	30.55	30.68	48.75	28.91	61.90	34 55	54.71	74.29	51.07	93.27	51.20	83 89
Coeff Var.	79 64	83.71	77.31	74 18	76.63	151.88	75.45	194.38	95.64	135.23	124.84	108.19	143.43	113.25	122.45	95.32	77.70	112.29	65.70	94 02	99.27	87.10	117.02	67.36	100 77
Kurtosis	5 95	9.10	6.51	1.31	16.53	47 35	1.34	30.53	7 17	20.22	19.76	5.84	26.87	5.38	11.46	17.26	4.19	12.69	7.86	12.88	22.11	5 49	19.31	2 97	13 45
Skewness	2 25	2.70	2.34	1 24	3 86	6.19	1.57	5.38	2 47	4 49	3.75	2.32	4.74	2.16	3.13	3.63	1.98	3 34	2.25	3.39	3 99	2 27	4 01	1.67	3 47

Similar occurrences are observed in the graphs of the 5 family categories. Thus in the single family category **House 100** constitutes a glitch . In the same graph a secondary glitch is formed by 3 houses, namely **Houses 97, 99** and **103**. Other glitches glaringly obvious in the 2 and 4 family category graphs are formed by **Houses 131,** and **151** respectively. The 5-and above family category graph has four glitches formed by **Houses 155 , 156, 159** and **160**. There is one thing common to all of these houses, and that is each is all identifiable as a " Big House. " The only exception is **House 131** which as noted earlier is really two houses functioning as a single house. In configuration then it is very much like a " Big House " (for details see infra **Chapter 8**).

6.3.2 Space Allocation

The main functional spaces identified earlier (supra **4.3.3**), namely, the *zaure*, *kofar gida*, *tsakar gida*, *rumfa* and *ɗaki*, are used as the basis for looking at space allocation both within and across the wards. However, for simplicity the *ƙofar gida* is omitted since it is essentially, and almost invariably an open space, and where it is not, it is usually a *turaka*, i.e. the apartment of the *maigida* or an outer room (*shago*). As explained, the *ƙofar gida* is but an extension of the *zaure*, just as the *rumfa* is an extension of the *ɗaki*.

Four aspects of space allocation will be examined here, namely;

a) the total floor area of the main functional spaces per house computed by summing up the individual areas for each main functional space. Thus for instance a house having 3 courtyards with 8m ^{2} , 9m^2 and 10 m^2 respectively will have a total courtyard area of 27 m^2 ;

b) the mean size of each main functional space; thus in the case of the above house with 3 courtyards the mean courtyard area will be 9 m^2;

c) the relationship between the total area of the main functional space area in a house and its population .

d) the rate of *ɗaki* occupancy or the number of persons per *ɗaki*.

Similar to the case of space provision, the dimensions and by extension the total area of the main functional spaces across the sample do not seem to follow any regular pattern. This is evident from an examination of **Appendix 7**, where wide variations in the total area of each of the main functional spaces are noticeable. A summary of the total area of the main functional spaces is extracted from **Appendix 7** and presented as **Table 6.5** . The high degree of variation in the sizes of the main functional spaces across the sample is indicated by the values of Standard Deviation and Coefficient of Variance. In each case the values of Standard Deviation are either very close to, or exceed the respective mean values. The values for the Coefficient of Variance start at around 80%, indicating discrepancies and little regularities in the respective individual figures . Interestingly and perhaps more significantly, is the fact that despite the high variation across the sample, the mean total area of each of the main functional spaces across the sectors not only varies little, but also shows close affinity to the respective sample mean .

There are however three major differences noticeable in the mean figures across the sectors. In the north sector the magnitudes of 43.93m ^{2} and 37.21 m^2 for the courtyard and the *ɗaki* respectively, are significantly lower compared to the respective sample figures of 63.56 m ^{2} and 51.15 m^2 . It would seem that these figures are the local reflections of the comparatively low total floor area of the north sector houses already noted in the preceding sub-section (supra § **6.3.1**).

Similarly the south sector figure of 33.83 m ^{2} recorded for the *zaure* is considerably higher than the figure of 26.10 m ^{2} recorded for the sample, or for any of the other sectors. This not unexpectedly , does indicate the high premium placed on the size of the *zaure* in the sector.

TABLE 6.6 : MEAN TOTAL FUNCTIONAL SPACE AREA

SECTOR	MEAN TOTAL FUNCTIONAL SPACE AREA (m^2)			
	Zaure	Courtyard	*Rumfa*	*Ɗaki*
Whole Sample	26.100	63.560	24.580	51.150
1-Family Houses	24.759	42.422	20.588	39.290
2-Family Houses	27.104	54.861	20.555	48.098
3-Family Houses	20.588	49.559	19.747	45.617
4-Family Houses	23.242	76.957	29.978	64.904
≥ 5-Family Houses	45.258	334.533	83.029	188.522

If the houses are differentiated by family size two other salient features become obvious. Firstly , the means for the 5-and-above family category differs markedly from the mean of the sample as a whole and from the respective means of the other family categories . In each case the magnitude of the mean functional space for the 5-and-above family category exceeds that of the means of the sample and the respective means of the other family categories by a factor of between 1.7 to 5.3 (**Table 6.6**) .

Secondly, unlike the case of the sectors, the mean total area of two functional spaces, the *zaure* and the *rumfa* , for each of the 1 to 4 -Family categories varies little and the respective figures show close affinity to the sample mean . On the other hand there are striking differences in the figures for the courtyard and the *ɗaki*. In the case of the courtyard the figures of 42.42 m ^{2} and 49.56 m^2 recorded for the 1-Family and 3-Family houses respectively, are considerably lower than the sample mean of 63.56m^2. In contrast the figure of 76.96m^2 recorded for the 4-Family is comparatively higher than the sample mean. Similarly in the case of the *ɗaki* the figures of

m^2 recorded for the 1-Family is considerably lower than the sample mean (i.e. 51.15 m^2), while the figure of 64. 90 m^2 recorded for the 4-Family houses is considerably higher·

What could one make out of these figures ? Why is it that at the global level , that is the houses grouped by sector or by family size, there is little difference in the mean total area of the functional spaces despite wide individual differences ? What do the huge differences observed in the courtyard figures and the lesser, but significant differences observed in the *ɗaki* figures of the houses differentiated by family size signify ? What could explain the anomaly observed in the 5-and-above family category figures ?

One possible explanation is perhaps to do with the fact that the determinants of physical space[123] act at different levels of social reality. Factors like age, sex, kinship and affinity tend to be manifest at the global level of the community because they are more likely to be shared. On the other hand, wealth, power, position and so on tend to be localised. Thus for instance kinship or sex relations, usually apply across the entire social fabric irrespective of position . On the other hand wealth or power, tend to be restricted to a few fortunate members of any society. In many cases these by themselves constitute the social boundary. If this is accepted, then one would expect individual differences at the unit level, which may or may not balance out at the group level.

The figures observed in the courtyard sizes may indicate two things; one is perhaps the higher degree of physical space investment in this type of functional space compared to the others, and two is the fact that part of the courtyard is traditionally considered as fallow space (*sheka*), which if the need arises is converted into one or the other of the functional spaces. It seems the first argument is more valid for the Kano, whereas the second would be more valid for a semi-urban milieu like that of Zaria.

In the case of the *ɗaki* though, the comparatively lower figure for the 1-Family houses is perhaps an indication of the degree of house fragmentation which as already noted (supra **§ 5.3.1.2**) is a normal feature of the Kano social scene. This coupled with the Hausa propensity for a *ɗaki* for every adult (supra **§ 3.3**) would make for smaller sized rooms. One would then consider the figure recorded for the 4-Family category as a statistical anomaly.

The wide variations evident in the 5-and-above family category compared to the other categories may simply mean these types of houses are yet to be subjected to the normal urban pressure for optimum land utilisation.

As to the little difference in the mean total area of the functional spaces when the houses are considered by sector, this may indicate a possible basic spatial quantity for each of the functional

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123 See note ~~159~~ above.

spaces. It seems there is a tendency for the total area of the functional spaces to be on average a minimum of between 20 to 40 m^2 per house, except for the courtyard.

TABLE 6.7: MEAN FUNCTIONAL SPACE SIZES

Description	MEAN FUNCTIONAL SPACE SIZES			
	Zaure	Courtyard	*Rumfa*	*Ɗaki*
Minimum (m^2)	3.19	7.60	3.260	3.39
Maximum (m^2)	34.25	199.80	33.20	20.62
Mean (m^2)	**9.173**	**32.52**	**9.38**	**9.12**
Std. Dev.	4.338	23.80	5.889	2.991
Coeff.Var.	47.29	73.17	62.78	32.79
Kurtosis	6.835	17.70	1.921	2.525
Skewness	2.013	3.47	0.731	1.378

What could one glean from the data about the mean dimensions of the main functional spaces ? In other words, what are the typical sizes of the main functional spaces and to what degree do these vary across the sample ? The mean sizes of the functional spaces are given in **Table 6.7**. These are 9.173 m^2, 32.52m^2, 9.38 m^2 and 9.12m^2 for the *zaure* , courtyard, *rumfa* and *ɗaki* respectively. From these figures we can draw two conclusions; one is that the mean size of any functional space other than the courtyard, is approximately 9 m^2 ; the other and perhaps more important conclusion is that on average a superficial ratio of almost 4: 1 exists between the size of the courtyard and the size of any of the main functional spaces.

TABLE 6.8: MEAN FUNCTIONAL SPACE AREA BY SECTOR

SECTOR	MEAN FUNCTIONAL SPACE AREA (m2)			
	Zaure	Courtyard	Rumfa	Ɗaki
Whole Sample	**9.173**	**32.52**	**9.38**	**9.12**
Arewa { North }	8.99	26.86	8.54	7.87
Gabas { East }	8.68	33.28	9.55	9.05
Kudu { South }	10.46	34.62	10.40	10.25
Yamma { West }	8.51	34.32	8.65	9.08

This aside the mean dimensions of the main functional spaces, generally show less variation spaces across the sample unlike the distribution of the total functional space areas already discussed. Even so, the dimensions of the *zaure* and the *ɗaki* exhibit much less variation by far, than those of the court yard or the *rumfa* (**Table 6.7**). Also the respective mean values exhibit little variation from those of the sample both when the houses are differentiated by sector

(**Table 6.8**), and by family size (**Table 6.9**) . All the same the figures for the south sector and the figures for the 5-and-above are appreciably lower than those of the other sectors and family categories respectively, as well as the sample mean.

What these figures strongly indicate is that there are certain spatial peculiarities appearing locally which could be related to any or several of the social parameters relating to physical space discussed above (supra § **6.3**) . Therefore explanations for these peculiarities would not be possible without going into the components that make up the sectors, i.e., the wards, in detail. One could then conclude that the results obtained would serve more as demonstrative figures for possible analogy rather than serve as definitive descriptions.

TABLE 6.9 : MEAN FUNCTIONAL SPACE AREA BY FAMILY SIZE

SECTOR	MEAN FUNCTIONAL SPACE AREA (m^2)			
	Zaure	Courtyard	*Rumfa*	*Ɗaki*
Whole Sample	**9.173**	**32.52**	**9.380**	**9.120**
1-Family Houses	9.222	30.682	9.878	9.367
2-Family Houses	9.451	32.248	8.055	8.610
3-Family Houses	8.551	45.126	7.359	9.581
4-Family Houses	8.210	22.326	8.267	7.317
≥ 5-Family Houses	9.167	53.526	11.166	9.491

Similar to the case of the total house area versus house population regressions, there are glitches observable in these graphs which are also attributable to the presence of " Big Houses" .

Table 6.10a compares the values of the house area - population regressions for the four sectors with those of the sample as a whole . It is noted that generally the functional space with the highest regression coefficient is the *ɗaki* whilst that with the lowest is the *zaure* ; the exception quite expectedly, is the north sector. The table also shows the regression coefficients for the courtyard to be not only comparatively high, but also much more stable in relation to the sample mean. Conversely the regression coefficients for the *rumfa* are generally inconsistent .

But could the collective magnitudes of the functional spaces be a function of the number of occupants in a house ? In other words, in determining the sizes of functional spaces would the population of the house be critical ? **Figure 6.7** shows the graphs of the total area of each functional space regressed against the number of occupants in a house. The highest correlation ($R^2 = 0.408$) is that between the total *ɗaki* area and the number of occupants in a house, while the lowest ($R^2 = 0.050$) is between the total *zaure* area and the house population .

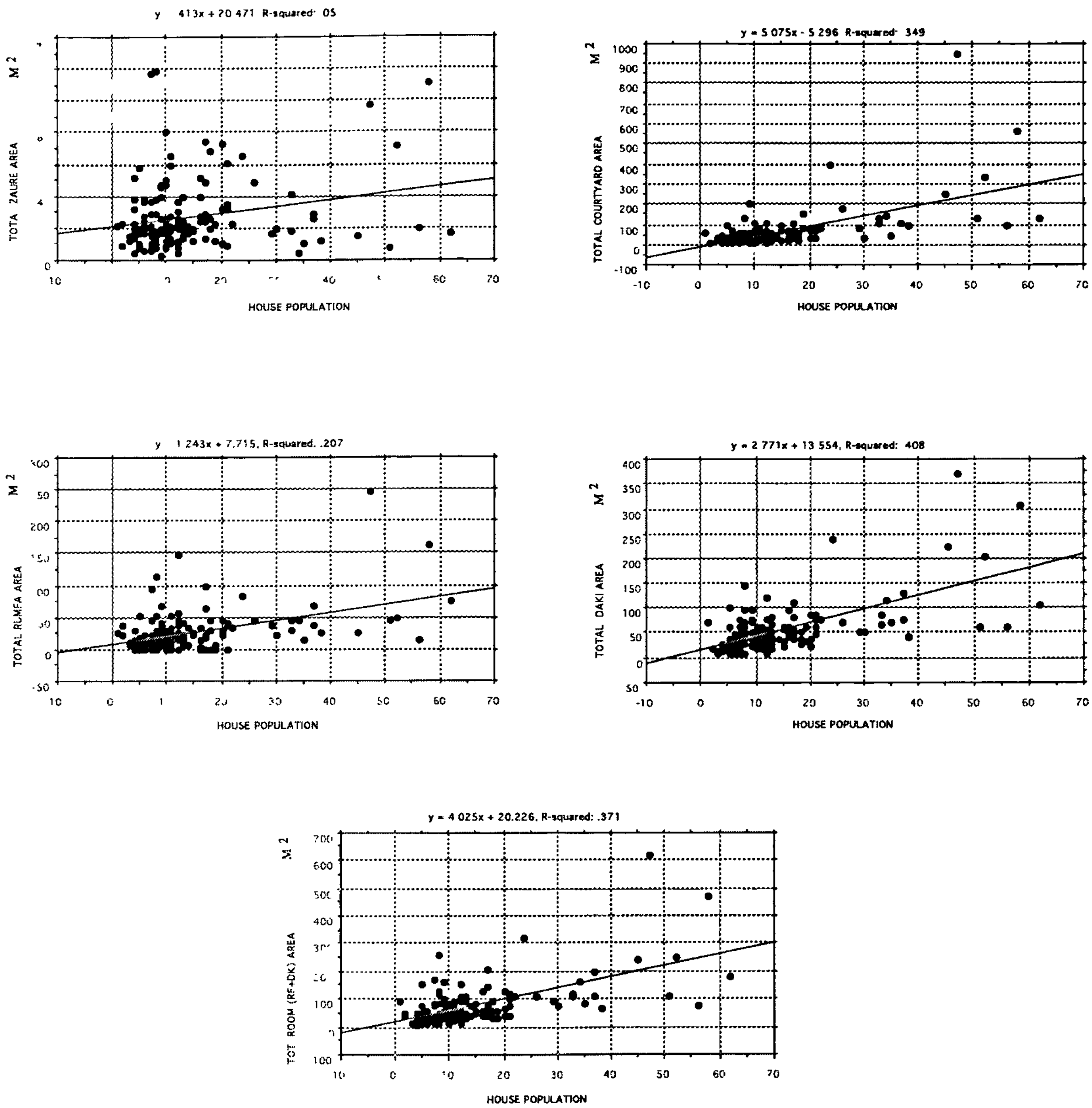

FIGURE 6.7: Population / Functional Space Area Regressions

Table 6.10 b compares the compares the values of the house area - population regressions for the 5 family categories with those of the sample as a whole . It is apparent that in each case the functional space with the lowest regression coefficient is the *zaure* . In addition a general pattern irrespective of the family size is discernible such that it is possible to order the regression coefficients for each category thus; the *ɗaki,* the courtyard, the *rumfa* and the *zaure* . These observation could lead to 4 basic conclusions about the relationship between the number of occupants in a house and the provision of the main functional spaces. First, the dimensions of the *zaure* relate little to the number of occupants, and one could safely conclude that the size and number of the *zaure* has less to do with purely utilitarian considerations and more to do with wealth, power and social position and so on [124]. Hence the highest mean *zaure* area per house noted in the south sector.

Second, the total *ɗaki* area is globally the best predictor of the number of occupants per house. This could be interpreted as evidence of the social fact that it is the only functional space that is personalised. No doubt this is principally to do with the Hausa one- adult - one-room principle.

TABLE 6.10a: FUNCTIONAL SPACE Vs. POPULATION REGRESSIONS BY FAMILY SIZE

CATEGORY	TOTAL FUNCTIONAL SPACE AREA VERSUS POPULATION REGRESSIONS (R^2)				
	Zaure	Courtyard	*Rumfa*	*Ɗaki*	Room *
Whole Sample	0.050	0.349	0.207	0.408	0.371
1-Family Houses	0.030	0.204	0.081	0.202	0.183
2-Family Houses	0.026	0.034	0.001	0.055	0.022
3-Family Houses	0.151	0.112	0.012	0.127	0.033
4-Family Houses	0.108	0.106	0.159	0.216	0.220
≥ 5-Family Houses	0.00 2	0.007	0.004	0.028	0.006

* The sum of *Ɗaki* and *Rumfa* areas.

Third, the comparatively high values of the *ɗaki* and the courtyard regression coefficients probably means that these spaces have similar, if not the same socio-functional value among the Hausa As we shall see later (infra **§ 7.3.1**) this supposition is not without its merits.

Finally , there is a poor ' fit ' between the magnitude of physical space available and the number of occupants in a house. Again a word of caution, this result does not necessarily imply the superficial imperfection of the main functional spaces for a given house population, rather the sizes of these spaces are not solely determined by the house population.

To conclude this subsection it would do well to look at room occupancy rate, which urban planners consider as one of the indices of good housing. The argument is to do with the rate of room occupancy as an indicator of overcrowding. This has a lot of sociological, as well as health implications, both physical and mental (Hall 1959; 1966). The ideal aimed at by many an urban planner or housing official in most 'third world' countries, is an adult - room ratio of 1 : 1 . However in practice a ratio of up to 1:3 is deemed acceptable. Where this ratio is higher, overcrowding is indicated (KSUDB 1980 ; Descom 1982).

[124] Although the prerogative of determining the number and size of the *zaure* is that of the *maigida* who is usually a male it is not invariable, nor is it uncommon for females that have succeeded in some social, political or economic endeavour to construct or maintain an imposing *zaure*.

TABLE 6.10b: FUNCTIONAL SPACE / POPULATION SECTOR REGRESSIONS

CATEGORY	TOTAL FUNCTIONAL SPACE AREA VERSUS POPULATION REGRESSIONS (R^2)				
	Zaure	Courtyard	*Rumfa*	*Ɗaki*	Room *
Whole Sample	0.050	0.349	0.207	0.408	0.371
North Sector	0.001	0.468	0.187	0.193	0.198
East Sector	0.116	0.491	0.382	0.629	0.577
South Sector	0.041	0.429	0.010	0.557	0.33
West Sector	0.191	0.434	0.404	0.416	0.427

* The sum of *Ɗaki* and *Rumfa* areas.

As we have seen the tradition in Hausa society is that every adult, regardless of sex, ideally is to have a *ɗaki* of his or her own. However this general rule is modified by marital status. For example although a male is entitled to a *ɗaki*, if he is a bachelor he may have to share *ɗaki* with other bachelors. Such a *ɗaki* is usually located near to or off the main *zaure*. Similarly an unmarried young female or a spinster may have to share *ɗaki* with other females or with young children. But a married adult almost invariably has a *ɗaki* and the female invariably has priority over the male[125]. Thus where a man has two or more wives living in the same house, then each wife must of necessity have a *ɗaki* to herself. If afterwards any *ɗaki* remains, he could then command one, otherwise he has no option but to share his personal effects among his wives.

TABLE 6.11a : ROOM OCCUPANCY RATE BY SECTOR

Description	NUMBER OF PERSONS PER *ƊAKI*				
	Whole Sample	North Sector	East Sector	South Sector	West Sector
Minimum	0.300	0.615	0.300	1.000	1.143
Maximum	7.000	6.000	7.000	6.000	5.503
Mean	2.67	3.169	2.452	2.630	2.542
Std. Dev.	1.291	1.452	1.264	1.158	1.215
Coeff.Var.	48.34	45.83	51. 54	44.06	47.80
Kurtosis	0.428	-0.915	2.571	0.488	-0.141
Skewness	0.868	0.239	1.328	0.845	0.896
Mode	3	-	3	-	-

Taking the sample as a whole , the rate of occupancy ranges from the statistically low figure of 0.3 person per *ɗaki* to a maximum of 7 persons per *ɗaki* . Despite this wide range, the variation recorded is not high as indicated by the Standard Deviation and the Coefficient of Variance which stand at 1.29 and 48.34 % respectively (**Table 6.11a &b**). The mean number of persons per *ɗaki* is 2.67.

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[125] In fact the availability of *ɗaki* is an absolute precondition for marrying an extra wife. Many an additional marriage is delayed or postponed until a *ɗaki* is made available or newly constructed. Two examples from the suburb of Fagge in the late 1950's illustrate the part ɗaki plays in the life of Hausa adults. In the first case a man resorted to divorcing one of his wives to make a *ɗaki* available for his widowed mother who came to live with him. In the second case, an elderly man living in the same house with his brothers and married children divorced his wife of some 20 years. But because there isn't any *ɗaki* for him to move to, and because his wife was also his cousin, he was forced to live in the *zaure* since his wife could not move back to her parents.

The respective mean occupancy rates for the sectors and the 5-family categories do not differ radically from that of the sample . The north sector with a mean of 3.17 persons per room, seems to be the most crowded while the east with a mean of 2.45 persons per room seems to be the least crowded (**Table 6.11a**) . It should be remembered that the north sector also recorded the least mean total floor area among the sectors.

In terms of family size, the 1-family and the 4-family category houses are the least and the most crowded respectively (**Table 6.11b**). One interesting observation worth emphasising is that most of the " Big Houses" have an occupancy rate of less than 2 persons per *ɗaki* .

Figure 6.8 shows the percentile distribution of occupancy rate for the sample. It shows that in terms of room occupancy houses in the sample could be broadly grouped into 5 . The first group are those houses that have a lot of *ɗaki* to spare. These constitute just under 5% of the whole. The second group of houses have occupancy rate of between 1 and 3 persons per *ɗaki* . Most of the houses in the sample, approximately 67% fall into this group. In the third group there are 25

TABLE 6.11b : ROOM OCCUPANCY RATE BY FAMILY SIZE

Description	NUMBER OF PERSONS PER *DAKI* BY FAMILY SIZE					
	Whole Sample	1-Family Houses	2-Family Houses	3-Family Houses	4-Family Houses	≥ 5-Family Houses
Minimum	0.300	0.300	0.615	1.80	2.30	1.50
Maximum	7	7	5.667	4.50	5.429	5.101
Mean	2.67	2.588	2.613	2.817	3.485	2.857
Std. Dev.	1.291	1.373	1.094	0.884	1.045	1.384
Coeff.Var.	48.341	53.037	41.871	31.403	29.982	48.43
Kurtosis	0.428	0.585	0.929	-0.373	-0.654	-1.444
Skewness	0.868	1.018	0.700	0.733	0.617	0.452
Mode	3	-	2.80	3	-	-

houses (or approximately 16%) with occupancy rate of over 3 but less than 4 persons per *ɗaki* . The remaining 2 groups are formed of the houses with 4 to 5, and over 5 persons per *ɗaki* constituting about 8 % and 6% of the sample respectively . What is significant about these figures is that about 70 % of all houses have 3 or less persons per *ɗaki* and hence by the accepted norm not overcrowded. Another significant fact is that both low and high occupancy rate houses are spread across the sample, regardless of sector or family size category .

What could we deduce from the preceding observations ? Mean room occupancy rates of 1.4 and 1.92 (Trevallion 1966:49; Jagiello/KSUDB 1980:43) were reported for Kano in 1963 and 1980. In 1978 Zaria city , another urban Hausa community, though less populous and certainly less urban, than Kano had an occupancy rate of 1.78 (Schwerdtfeger 1982:332). The difference in the rates of

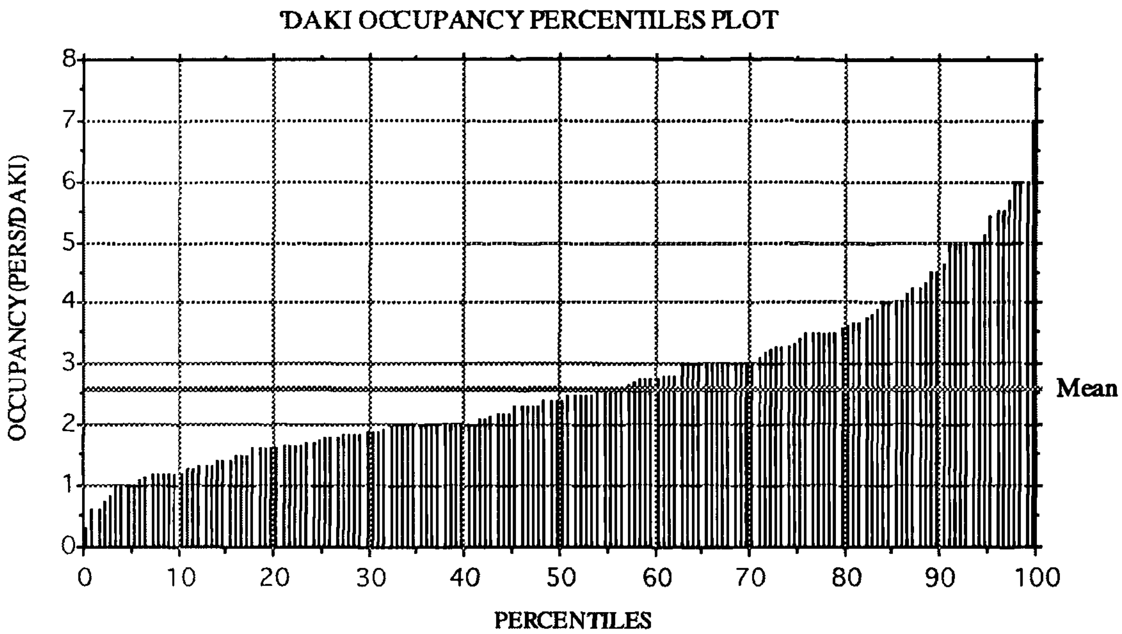

Figure 6.8 : Ɗaki Occupancy Rate Distribution.

occupancy between Kano and Zaria could be explained in terms of the level of urbanisation between the two cities. Comparing the mean room occupancy rate for Kano City in 1963 and 1980 with the mean obtained above, it becomes obvious that the rate increases by about 70 % approximately every 15 years; it has thus almost doubled from 1.40 to 2.67, over a period of thirty years. This could mean an increase in population or a decrease in housing conditions, or both. The Nigerian National Census Commission did declare a considerable increase in the Kano population from about 6 million in 1963 to about 9 million in 1992[127]. And not many people would dispute the proposition that housing conditions, in the walled city, have declined in the last couple of decades. However as noted above, in a society like that of the Hausa, room occupancy rate does not give an accurate measure of over crowding. This is because the *ɗaki* is not the only place for sleeping, nor is it the only place for other quotidian activity as will be discussed later (infra Chapter 7). Thus despite the rise in room occupancy ratio and the lowering of the socio-cultural standard of 'one-adult-one -room', Kano is neither overcrowded nor is there a feeling of overcrowding among its populace.

6. 4 Space Opacity

Closely related to space allocation is the ratio of the open space to total floor area, or what we term Opacity . This is implied in certain aspects of the concept and organisation of physical space. First, in a dry hot climate like that of Kano, the measure of habitation comfort is closely related to how much heat is dissipated or how well a house is ventilated. The open space in a house is

[127] The 1963 figures refers to the defunct Emirate of Kano, while the 1992 figures refers to the contemporary states of Kano and Jigawa. Although a breakdown of the 1992 figures is yet to be published, the 1963 figures have a breakdown of 333,000 for Kano Municipal and 194,000 for the Walled City.

perhaps one of the best ways, given the circumstances, of ensuring climatic comfort, which has the additional advantage of providing adequate lighting within the house.

TABLE 6.12a : SECTOR OPACITY : BUILT-UP TO OPEN AREA RATIO

Description	HOUSE OPACITY				
	Whole Sample	Fuskar Arewa { North }	Fuskar Gabas { East }	Fuskar Kudu { South }	Fuskar Yamma { West }
Minimum	0.051	0.102	0.110	0.051	0.15
Maximum	0.607	0.401	0.468	0.607	0.399
Mean	0.242	0.230	0.239	0.238	0.268
Std. Dev.	0.092	0.072	0.087	0.124	0.069
Coeff.Var.	38.024	31.137	36.37	52.165	25.87
Kurtosis	1.27	- 0.0001	- 0.11	1.021	-0.678
Skewness	0.851	0.724	0.841	0.959	0.314

Secondly, traditionally Hausa dwellings were never conceived of as static units. Their size and spatial layout were largely dependent on the growth and development, or decline of the residential family groups (Schwerdtfeger 1982:312). As noted above, every dwelling where possible has some fallow space known as *sheka*, integral to it, which makes it possible to regulate the size and organisation of the dwelling as the need arises. In the planning and organisation of Hausa settlements this is an important and powerful concept which regulates the 'fit' between physical space and its inhabitants (**Appendix** 1). The total utilisation of the *sheka* signifies the full development of the house or settlement. While in the case of the settlement the next stage would be the extension of the city wall to encompass more land, in the case of the house, the next stage would the establishment of a new house. Therefore the magnitude of the unbuilt physical space is an indication of the degree of flexibility or adaptability of the house to changes in the inhabitants development cycle. The higher the Opacity the more its spatial flexibility, and vice-versa.

Thirdly, the concept of courtyard is not purely utilitarian. At the level of the symbolic, what is invested in open space could be as much or even more than that invested in closed space . As already noted, on average the size of courtyard is more than 3 times the size of any other functional space (supra **§ 6.3.2**). Thus the size and number of courtyards is probably one of the strongest indicators of socio-cultural preferences.

Opacity values across the sample range from 0.051 to 0.607, that is from a house with only about 5 % open area to one with about 61% of its total floor area unbuilt. This wide range notwithstanding, Opacity varies little as indicated by the low values of Standard Deviation, 0.093 and Coefficient of Variance, 38.02 % (**Table 6.12 a &b**). What is even more interesting is the fact that similar pattern is exhibited by the sectors and by the 5 family categories. In either case the mean values approximate the sample mean of 0.242. The only exception is the case of the 5-and-above family category, which has the highest mean Opacity value. This category also has the lowest values of Standard Deviation and Coefficient of Variance .

TABLE 6.12b : OPACITY : BUILT-UP TO OPEN AREA RATIO

Description	HOUSE OPACITY					
	Sample	1-Family Houses	2-Family Houses	3-Family Houses	4-Family Houses	≥ 5-Family Houses
Minimum	0.051	0.051	0.145	0.150	0.169	0.240
Maximum	0.607	0.607	0.462	0.433	0.364	0.455
Mean	0.242	0.227	0.253	0.246	0.272	0.345
Std. Dev.	0.092	0.094	0.083	0.091	0.062	0.060
Coeff.Var.	38.024	41.188	32.919	37.135	22.861	17.432
Kurtosis	1.27	2.680	-0.290	0.194	-0.850	0.034
Skewness	0.851	1.209	0.689	0.995	-0.221	0.098

Figure 6.9 shows the percentile distribution of Opacity values across the sample. This is very much similar to the *daki* occupancy distribution discussed above. In this case houses in the sample could be broadly categorised into 4 groups. The first group consists of about 10% of the houses with an Opacity value of up to 0.15 or only 15% of total floor area unbuilt . The second group of houses have Opacity values of between 0.15 and 0.35, that is they have up to 35% of total floor area open. This is the largest group with about 80 % of the houses in the sample. The third and fourth groups comprise of houses with Opacity values of up to 0.45 and 0.67 respectively. Between them they account for the remaining 10% of the houses.

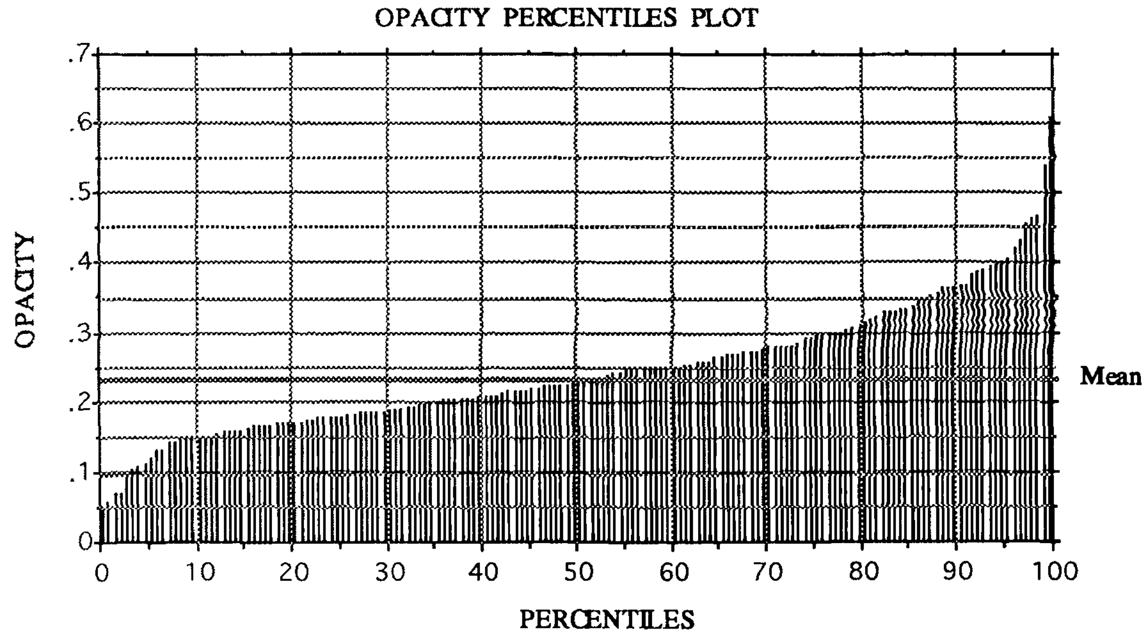

Figure 6.9 : Opacity Distribution.

From the foregoing one could see that Opacity values are spread across the sample, with little respect to sector or family size category . More importantly about 40% of the houses overall, have Opacity values above the sample mean of 0.242 .

What do these figures signify ? First, the mean Opacity of 0.242 is about a third of the 0.675 reported for Zaria in 1967 (Schwerdtfeger 1982:32) [127]. Taking into account the time difference, the discrepancy could be explained as a measure of the difference in urbanity between the two cities. Second, this ratio translates into on average, about one quarter of the entire dwelling area left unbuilt. This is almost the reverse of the ratio of built up to open area in the Kano urban space (**Appendix 1**), where only between one quarter and one third of the urban land is allowed to be built upon; a ratio scrupulously adhered to until contemporary times (Frishman 1977). If it is assumed that this ratio was also applied in domestic architecture, then the mean Opacity for Kano City is well below the acceptable limit.

The mean Opacity of 0.675 for the houses in Zaria City tends to support this argument. However if one takes into account the fact that Kano city is larger and much more urban than Zaria city and therefore land is at a higher premium, then perhaps a figure of 0.675 is a little on the high side.

Given this argument , a mean Opacity of 0.24 could be interpreted in many ways; an index of urbanity; land use optimisation as a result of the attainment of full developmental cycle; increasing physical compactness and a possible decrease in climatic comfort; and above all the lowering of cultural ideals as a result of social and economic changes. Any and several of these premises would be valid for the Kano social milieu.

6.5 Summary

In analysing the physical aspects of the Hausa house as exemplified by the Kano milieu, certain things are common to all houses whereas others are variable depending on family size or house location. First, there are 4 broad construction types based on how walls are constructed and finished and how rooms are roofed. Wall constructions are either of adobe or concrete with a few cases a mixture of the two. There are also two basic roof types namely the traditional roof construction using deleb palm as beams or rafters, this could be arched or flat, and using corrugated iron sheets. Wall finishes are either cob or cement screed on adobe walls while it is cement plaster on concrete walls. What is significant is that although in general most of the houses in the sample are of adobe (*tubali*) construction, *azara* roofing and cement-screed finishing, these construction types are to be found in every part of the city. The absence of cob finish in the north and east sectors should be understood as a statistical anomaly.

The persistence of the use of adobe is indicative not only of its viability as a construction material but also its feasibility from an economic point of view. That however most of the houses built in concrete are single family houses is undoubtedly to do with the fact that the decision and resolve to construct is better taken individually rather than collectively.

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127 This is computed from the data given in the reference; 47,552 m^2 of total area against 16,268 m^2 of built up area.

There are wide variations in the total floor area across the sample. The highest variations are noticed in the magnitudes of the upper floor areas, while the lowest are observed in the magnitudes of the unit floor areas; in consequence house sizes vary considerably. A major contributory factor is the presence of what has been termed " Big Houses" . This is because generally these houses have comparatively low populations and large total floor areas or vice - versa. Locally the lowest mean unit floor area is found in the north sector, one of the oldest part of the city. There is not much difference between the unit house area means for the other sectors and the unit house area mean for the sample.

The magnitude of the total floor area per house bears little relation to the number of people in the house. Generally the number of persons in a house relates poorly to its size, and more to the number of families it contains; there is thus some consistency in the relationship between total floor area and the size of the family.

Four main functional spaces were identified in the houses, namely the *zaure* (entrance hall) courtyard *rumfa* (inner hall) and *ɗaki* (room). The sizes of these functional spaces and by extension their total area vary considerably across the sample. Interestingly and perhaps more significantly, is the fact that despite the high variation across the sample, the mean total area of each of the main functional spaces across the sectors not only varies little, but also shows close affinity to the respective sample mean .

The relationship between the sizes of the main functional spaces and the population of the house is more critical when the houses are considered geographically. It was discovered that the total *ɗaki* area is globally the best predictor of the number of occupants per house. On the other hand there is almost no relation between the dimensions of the *zaure* and the number of house occupants. Thus confirming what is known intuitively that the size and number of the *zaure* has less to do with purely utilitarian considerations and more to do with wealth, power and social position .

About two-thirds of the houses in the sample have room occupancy rate of between 1 and 3 persons per *ɗaki* . The mean for the sample is however 2.67. Room occupancy rate has thus almost doubled from an average of 1.40 in 1963 indicating an increase in population and a consequent decrease in housing conditions.

Finally the ratio of the open to built -up area in the house, or what was termed Opacity for most of the houses ranges between 0.15 and 0.35, that is from 15% to 35% of total floor area is left unbuilt . This is almost the reverse of the ratio of built up to open area in the Kano urban space where only between one quarter and one third of the urban land is allowed to be built upon.

CHAPTER SEVEN : SOCIO-CULTURAL ASPECTS OF THE HOUSE

7.1 General

There are certain attributes of the house that cannot be perceived or apprehended from its form or mere physical looks. One such attribute is its functionality, that is how it is utilised, and the other is its actuality; by this is meant its ownership and its relation to its environment ; to other houses, to the locality and to the settlement as a whole. A mutual relationship exists between the form and content of family relations within the dwelling and the form and content of social relations outside it. In other words, what goes on outside the house bears strongly on what goes on inside it and vice-versa.

Once the threshold that divides the exterior and the domestic dwelling is crossed a whole new dimension is entered into. A house is for living; the discrete aggregation of spaces that form a house are the settings for behaviour or human activity patterns. Given the nature of architecture a relationship between architectural space and people; more specifically the behaviour of people, is to be expected. However, different people act differently in different spatial settings, hence there is as much if not more, diversity in the organisation and use of domestic spaces as there is in the physically perceptible forms of the dwelling. Thus the way space is used in a domestic setting is not only a prerequisite for understanding a society's built environment, but also one of the best means of interpreting its socio-cultural codes (Glassie 1975; Toffin 1994).

The man-environment relationship both within and without the house, with emphasis on the socio-cultural aspects, that is those aspects that bear directly on everyday living and perception, is the focus of this chapter. Here the actuality of the house is explored by examining certain socio - cultural dispositions; also explored is the functionality of the house by examining the quotidian use of functional spaces . In particular the questions that will be addressed here are; Who among the inhabitants owns the house and how ? What is the relationship between the occupants of the house and their immediate neighbours ? What is the perception of the occupants regarding their house, its locale and its regional location, i.e. the ward and the city respectively ? What is the pattern of daily space use based on the dominant activities of the occupants ? And finally, which of the spaces is gender specific and which is neutral ?

7.2 Socio-Cultural Disposition

Of the attributes of a house that cannot be perceived or apprehended from its form or mere physical looks, three are the most significant. First is its ownership; who occupies it and how did they come about that ? Answer to these questions would result in understanding the origin of the house and its raison d'être. Second, the way the house, or more specifically its inhabitants relate to the inhabitants of other houses in its immediate locality and the environment at large. This places the house in its social context . And finally its compatibility ; by this is meant the degree of the inhabitants satisfaction with the house as a place for living, as a means of identity and as a status symbol . This is the subject of this section.

7.2.1 House Ownership : Who And How

While conducting fieldwork the chief informants on the social aspects of the house were the respective house heads (supra § **4.3.2**). The impression might be made that since all questions concerning the house were addressed to the *maigida* ,[129] he must of necessity be the owner of the house. Despite the term, this is far from what constitutes the reality of house ownership. For in reality the term the *maigida* , refers to the person in charge or in control of the house affairs. In some cases, for example the 'Big Houses', the *maigida* may not even be in charge of running or maintaining the affairs of the house but only its spokesman, by virtue of his age or social position. In many cases the major decisions affecting the house devolve on the person with the most means.

TABLE 7.1: SUMMARY OF HOUSE OWNERSHIP PATTERN

Sector	MEANS OF POSSESSION OR OCCUPATION %			
	Inherited	Purchased or Constructed	Granted	Rented
North	71.43	22.85	2.860	2.860
East	72.72	14.50	9.095	3.640
South	67.50	20.00	7.500	5.000
West	73.33	20.00	6.670	0.000
Sample	**71.25**	**18.75**	**6.870**	**3.130**

From a scrutiny of the data five means of possessing and or occupying a house were identified, namely inheritance, purchase, new construction, rent and grant (**Appendices 4 & 5**). A summary of the means of ownership or occupation is presented as **Table 7.1**. The analysis that follows will be based on these two sources. From these it is easy to see that most of the houses forming the sample, barring the 'Big Houses'[130], were owned by one of the inhabitants of the house, who may or may not be the *maigida* . Out of these, four houses are owned by females; two of whom are widowers, one a divorcee and the other married. These are **Houses 27, 125, 44 and 33** respectively. The last house, that is **House 33** is interesting in many ways. Its owner is a rich and successful *gwaurau* or traditional herbalist whose husband is a poor local barber. The

[129]The term *maigida* , meaning house owner, is a remnant of the pre-market economy times when the family not only lived and ate together, but above all worked collectively. In that period, the term *maigida* was used to refer to a person who established a fully fledged family, comprising of his sons and their families, or on the demise of their father, the eldest person among several brothers, each with his family (Smith 1959 &1965; Hill 1977; Goddard 1977). The duties of the *maigida* included among others, sharing out farm work; controlling harvest and arbitrating amongst family members.

[130]Most of the houses in the sample that we designate, 'Big House' are composed of several (on average 5-7) agnatic families, each living in a separate section (called *sashe* or *waje*), of which the essential determinant is an integral courtyard, over and above any central courtyard that the 'Big House' may have. Although possession is collective, each of these families maintains a more or less independent budget. However there are other houses that, except for the fact that they do not have families in separate sections, exhibit virtually the same characteristics as a 'Big House'.

husband came to live with the wife instead of the other way round as is traditional. Although this not unheard of it is indeed not very common [131]. Of special interest is the fact that the man is considered as the *maigida* rather than the wife even though he does not own the house and in the event of a divorce he would be moving out.

In about three-quarters of the cases possession of the house was through inheritance. This is not surprising since as noted earlier (supra § **5. 3**) many houses fragment at the death of the *maigida* ; or when a certain critical level of growth is reached. This could also happen when siblings part company for any number of reasons and decide to found their own houses. The next means of possession is purchase or new construction which account for the ownership of approximately 19% of the houses in the sample. Only about one-tenth of the houses were occupied by those who did not own them. Of these about 7 % were on grant [132], while the remaining 3% were rented houses [133]. Thus in the walled city, we have a unique situation where house ownership, individually or collectively is about 90% .

This level of house ownership is impressive and has several implications. First, these figures reflect the land tenure system in operation when most of the houses were constructed, for until the advent of colonialism and even beyond, not much premium was put on land per se, but on how it is utilised (Frishman 1988: 11). Studies made of parts of Kano and Zaria outside the respective walled cities, yield figures that are almost exactly the reverse of these, i.e. most of the occupants of the houses surveyed were tenants rather than house owners (Trevallion 1966: 48; Descom 1982: 73; Yashim 1974 : 45).

Second, it confirms what has been noted elsewhere about the Kano urban milieu, that there still exists a strong social cohesion (Trevallion 1966; Frishman 1977), which in turn may indicate a strong cultural homogeneity. Hausa culture, unlike many West African sub-cultures has retained its vigour and potency. This, as noted by Rapoport (1969: 79), happens where the key elements of a culture have high criticality and hence thrive and persist .

Third, it attests to the high premium placed on house ownership in the Kano urban milieu. Note has already been made about the Hausa association of adulthood with marriage and social status, and responsibility with the control or possession of a house (supra **§ 3. ~~4~~ 5** & note 72). As we shall see later (infra **§ 7.2.3**) there is a strong tendency for adults to want to have a house of their own over and above any family house that they may have a stake in. Although this is more

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[131] There are numerous Hausa terms for this kind of marriage; *tafi-da-kwarinka* , *tafi-da-sandarka* , *haura - takalmi* etc.

[132] *Aro* is the Hausa term for this. It is a kind of permission to live gratis in a house, with or without the obligation to maintain it . This can be for a specified period, for as long as the owner is not in need of the house, or even for as long as the tenant is alive.

[133] These figures represent only those houses that were wholly granted or rented. It does not take into account the many cases were a *ɗaki*, or even a section is granted or rented to someone, nor does it take into account the almostuniversal custom of allowing unmarried non-agnatic male adults to live in the main *zaure* or secondary *soro* .

common in the case of males, it is not uncommon for females who have succeeded in some economic endeavour to want to invest towards owning a house[134]. **House 33** is a good example of this.

Finally, it may mean that the Kano society is a closed society with a consequent low social mobility. This is manifestly not the case, for as already noted above (supra **§ 3.4**) the Hausa society in general and the Kano urban milieu in particular has always been, and still is very much an open society. It is a well documented fact that the population of Kano has always been dynamic rather than static, with strong seasonal variations; the dry season figures almost invariably higher than the corresponding wet season figures (Barth { 1854}1965; Trevallion 1966; Frishman 1977;). The 1926 Kano Annual Report lists no less than 23 different ethnic groups in the vicinity of the Kano urban area . Similarly the 1963 National Census lists over 30 ethnic groups. Since then this figure has only increased [135]. In fact there is hardly any ethnic group in West and North Africa that is not well represented in the Kano milieu.

This is not the place to dwell at length on the openness of the Kano society, but two things more than anything are responsible for the high influx of outsiders into Kano. These are the Hausa society's high tolerance of and respect for other cultures, and the highly assimilative nature of Hausa culture (Hallam 1966; Mahadi 1989; Albasu 1990). Both traits are prerequisites of an open society with a fair degree of social mobility.

Referring to **Table 7.1** again it is easily noticed that inheritance is the chief means of owning or occupying a house. It accounts for on average 71% of all cases. This is regardless of the location of the house in the city. Purchasing or building accounts for on a average 18% and is the second highest means of occupation. That the lowest incidence of this is in the east sector is to be expected. This is because as the smallest and the most restricted of city sectors with virtually no open space, new constructions are highly impractical if not impossible. In addition its proximity to the *Kurmi* market makes houses here more valuable and people less inclined to sell out .

Another interesting feature of the city brought out by the table is the fact that there are on average twice as many houses granted than rented; 6.8 % as against 3.1% respectively. There seems to be two anomalies in the north and west sector distribution of granted and rented houses respectively. One is hard put for a plausible explanation to account for this discrepancy. A possible explanation perhaps would be to attribute these results to statistical bias.

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[134] There are no figures to back this statement, but the general perception is that women tend to buy houses rather than construct them, whereas with men it is the reverse.

[135] In a private conversation with a senior official of the Kano State Ministry of Information Youth & Culture (Jan . 1994)) it was reliably gathered that between 1980 and 1990 no less than 5 % of all National Youth Service Corps members from other parts of the country ultimately end up living or settling in or around Kano.

7.2.2 The House : Social Cohabitation[136]

The relationship between the occupants of a house and their immediate neighbours constitutes one of the parameters of social network . This relationship is either that of blood or that of mind, i.e. friendship. In Hausa society blood relationship is minimally differentiated[137]. By this is meant that cousins (first, second etc.) are socially given the same status as brothers and sisters. Similarly uncles and aunts get the same deference given to fathers and mothers.

When it comes to friendship, the Hausa distinguish between the general, the familiar and the intimate friend refered to as *aboki*, *abokin ƙwarai* or *zumu* and *amini* respectively. However it is not unusual to refer to the latter type of friend as *ɗan'uwa* i.e., a relative.

A summary of the information collected on certain socio-cultural characteristics[138] (**Appendices 4 & 5**) is presented as **Table 7.2** . It is seen from this that overall about 30 % of the inhabitants of the houses have their relatives living close by, either adjacent or across from the road or alley, as the case maybe. Sector wise there is only a slight variation in the pattern of this neighbour-relationship. Surprisingly the west sector, the least and the most recently populated has the highest figure.

TABLE 7.2: SUMMARY OF SOCIO - CULTURAL CHARACTERISTICS

Sector	Soc. Cohab (% With Kin Nearby)	INHABITANTS PERCEPTION				
		Dwelling Satisfaction %			Location Satisfaction %	
		No Modification	Spatial Modification	Physical Modification	Relocate Ward	Relocate City
Sample	**30.63**	**13.13**	**19.37**	**76.50**	**77.50**	**21.87**
North	31.43	17.40	5.710	77.14	80.00	20.00
East	30.91	9.100	27.27	63.63	63.63	36.36
South	27.50	22.50	17.50	60.00	87.50	12.50
West	33.33	3.330	23.33	73.33	83.33	16.66

That about one-third of one's neighbours are relatives, real or perceived (see above notes 9 & 10), is not surprising given that most of the houses surveyed were owned by the occupants through the act of inheritance (supra **§ 7.2.1**). As it is well known the Islamic Laws of Inheritance (Qur'an 4: 11-12 & 176), tend to sub-divide rather than aggregate estate. The Laws do this by

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[136] I owe much to my colleague Mrs Farida Nilufar in preparing this sub-section. I am grateful for her time and comments.

[137] The Hausa have two words for expressing blood relationship; *dangi* and *'yan 'uwa*. *Dangi* usually refers to distant relatives or those whose relationship is not well known or clearly defined. *'Yan uwa* is usually used to refer to close relations or those whose relationship is much valued. Thus to take an extreme example, if one is brought up in a house he or she is considered as *ɗan'uwa* (fem: *'yar'uwa*), even though he or she is the son or daughter of the house slave, or nowadays the house servant. Thus it is not uncommon to refer to a very close friend as *ɗan'uwa* or *'yar'uwa* . There is another word though which because of its negative connotation is rarely used, and this is the word *'yan'uba*. Strictly speaking it means paternal half-brothers or sisters, but socially the word is used for all those relatives that betray one.

[138] The question asked was on the blood relationship (*dangantaka*) with the neighbour (See **Appendix 4**).

apportioning a definite and proportionate share to every offspring from the estate of a deceased person. Another possible contributory factor is that if, as some scientists posit, social contact is a function of spatial propinquity, it might also be true that spatial propinquity is a function of social closeness. One hasten to add that this is not invariably the case, and thus it should not be taken as a definitive statement . However the fact that the wards in the city are spatial entities based on social grouping and identity lends support to this proposition.

7.2.3 The House : Occupants' Perception

If as noted above, there is some affinity between the inhabitants of a house and their immediate neighbours, then it is even more pertinent that some affinity should exist between the inhabitants and their home in particular, and its locality in general. Indeed the very idea of home presupposes personal and cultural affinities. But culture is not static, nor are personal preferences. What then is the perception of the Kano City inhabitants regarding their homes, their respective localities and the city as a whole? First we look at the perception of the inhabitants regarding the house they live in.[139]

The following discussion is based on the response to questions 22-26 inclusive addressed to the *maigida* (**Appendix 4**) , and to questions 22-24 inclusive addressed to the *uwargida* , the senior female of every house (**Appendix 5**). A summary of this is presented under 'Dwelling Satisfaction ' in **Table 7.2.**

On average only 13.13 % of the respondents found their homes satisfactory in most respects. For this group they could see little blameworthy in the way their houses were. It is worthy to note that most of these were those who have personally constructed their houses or had recently acquired them through purchase. However many of them did accede that it is possible for them to find the house unsatisfactory in the future.

Sector wise the number of people who found their houses satisfactory ranges from as low as 3.33% to as high as 22.50% for the west and south sectors respectively. The low level of satisfaction recorded in the west sector is perhaps to do with the fact that this sector contains some of the poorest wards in the walled city. On the other hand the response recorded for the south sector is not surprising because this is mainly the locale of the nobility and their clients. And as a study (Sa'ad 1981: 356) has shown, the Hausa nobility are the trend setters in indigenous architecture.

When questioned about the aspects of their houses not satisfactory, only about 19 % of the respondents mentioned spatial quality, i.e., the arrangement, location and orientation of the principal functional spaces within the house. Across the sectors this ranges from as low as 5.71%

139 This response deals with the house itself without reference to its location. The question of location has been covered above under the perception of the city.

to as high as 27.27 % for the north and east sectors respectively. The high figures for the east and west sectors are due to the respondents general feeling of spatial constriction which they attribute to the inadequacy of the number of rooms in their houses[140]. T his feeling of spatial constriction is more acutely expressed in the east sector.

The majority of respondents, on average 76.50 %, were dissatisfied with the physical aspects of their houses. Across the sectors the story is very much the same. Generally, the dissatisfaction expressed with the physical state of the houses relates to the roof, the wall material, the flooring and the wall finishes, in that order . Although nothing is said about building components like doors and windows, yet it is understood that these have to change commensurate with the materials of construction. Thus most of the respondents would rather have their houses rebuilt with cement blocks, roofed with metal sheets and finished with oil based paints on cement plaster. The least many would settle for, is to have their roofs covered with corrugated iron sheets. The reasons given for this preference are the durability of these building materials, the ease of maintenance and their modernity or fashionableness. Significantly *not one person* gave climatic comfort [141] as the reason for preferring the new building materials.

These reasons seem plausible enough, but a more probing look leads to another equally valid but not so obvious reason for these preferences; and this is the colonial policy towards planning and urban development . It is an established fact (Daldy 1945; Foyle 1959; Fika 1972), that in their first couple of decades as rulers, the British for certain economic and expedient reasons patronised the Kano indigenous builders, by commissioning them to construct most of their buildings, barracks, offices and residences using indigenous building materials. Subsequently new building materials were introduced, but it was not until the period between the wars that the colonial government started to actively encourage the use of these materials and to discourage the use of local building materials.

This was done, following the practice of the British mode of government, in several indirect ways. The first is the zoning of Kano into three areas, European, Native Township and the Walled City, following the acceptance of the TS Rice " Memorandum On Segregation And Town Planning " in 1923 (Frishman 1977:119). The Walled City was designated as a native area, and hence unfit for European habitation, presumably on 'health' grounds. By this act the entire environment of the City was effectively condemned. The European residential area, where only the new building materials were permitted, became the model environment [142]. Secondly, while the Town Planning

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140 There was some difficulty in categorising some of the answers got from the respondents, regarding the spatial quality. In particular is the respondents tendency to equate the number of rooms with the spatial organisation of the house rather than with the physical qualities of the house. In the end it was decided to accept this notion because it is a cultural concept. Hence all the figures quoted for spatial dissatisfaction include the inadequacy of the number of rooms.

141 When this was pointed out to a few of the respondents, most of them waved it as not important. In their opinion this is not a problem given enough means to install and maintain the machinery capable of changing and controlling micro-climate.

142 To this day no permit is granted to one to construct a residence using local building materials in all the new residential areas in Kano, even though no written law could be cited.

Office, the progenitor of the modern Urban Development Board, strictly enforced building standards of design and construction in Nassarawa, it only did this half-heartedly in the Native Township and not at all in the Walled City. Thirdly, the colonial policy of technical education favoured the training of bricklayers, carpenters, plumbers and electricians, geared towards the perpetuation of the western type of built environment, according to Sa'ad (1986:109),"to the exclusion of traditional skills". If these acts sounded the death knell to the indigenous building industry, the *coup de grace* came in 1938 when Emir Abdullahi Bayero under the influence of 'modernisation' ordered the demolition of the century old Main Mosque , and its replacement with another Mosque built in concrete. The design of this Mosque was imported from, of all places Turkey.

Thus by the time of the second[143] groundnut boom 1927 to 1930 (Hogendorn 1978:132-133), the idea of using new building materials had started to germinate. The agricultural economic prosperity of the 1950s only helped to further consolidate this trend. People opened up to the use of new building materials; those who could afford used cement blocks to build and corrugated sheets to roof, while those not wealthy enough resorted to the partial use of these materials.

Next we consider the response regarding the location of the house. A summary of this response is also presented under the heading " Location Satisfaction " in **Table 7.2.** From the table it is seen that more than three-quarters of the respondents would prefer to move to another ward, albeit within the city. Again within the sectors response varied from about two-thirds positive for the east sector, to almost 90 % positive for the south sector. The preferred wards are the new wards of ***Sani Mai Nagge, Gadon Kaya*** and ***Gwammaja***, to the West and North-West of the walled city respectively. The spatial layouts of these areas are based on loose grid-like pattern that for the most parts allow vehicular accessibility.

The main reason given for preferring these areas over the city wards, is what the respondents term the restrictiveness[144] of the city wards. When further clarification is sought most respondents would give accessibility, ease of house construction using new building materials and room for expansion, as the reasons for their choice. Again these reasons are weak, most especially that of ease of construction. While these preferred areas are clearly more accessible than the older parts of the walled city, the older parts are not completely closed to vehicular access[145]. As to room for expansion, these new residential areas based as they are on standard plots of 50' by 50' or multiples thereof, have even more restricted room for expansion than most parts of the city.

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143 The first groundnut boom of 1912 to 1914 was perhaps more beneficial to the expatriates than to the indigenous population, although it did make people aware of the economic potential of groundnut. See Hogendorn 1978 & Shenton 1981.

144 The actual response in Hausa is , "*rashin wadatar waje* ". This expression could mean in this context, inaccessibility, lack of adequate space, spatial constriction or even lack of comfort .

145 Despite the fact that the city was conceived with the horse rather than the motor vehicle in mind, it is still possible to drive a car from Mandawari ward through Sabon Sara, Akwa, Jingau, and Gyaranya wards to TudunWada ward.

But what could possibly account for this strong perception of the restrictiveness of the older wards ? There are four possible reasons; the first is that as noted above, most of the houses are passed down to offspring and except for the extremely wealthy, not many people have enough property to bequeath a house to each offspring. In many cases offspring may have to share a single house. This poses little problem if they also inherit their fathers trade and they are all of the same mother. Where this is not so, they may end up having only a part of the house. This is usually the case given the changing times and the fact that polygamy is still a strong aspect of the Hausa culture. In extreme cases one's inheritance may be only a single room.

Secondly, offspring may not like to maintain the same life style that their parents had, especially if they have become wealthy or they have attained some political status, thus making new friends and imbibing new life styles. The strong social bonding still existing in the city, means lack of anonymity and the obligation to be one's " brothers' keeper". While some nouveaux-riches are truly selfish and migrate to the new wards as soon as they are able , it is also equally true that some people take this social obligation as an excuse to put untold burden on others. Relocating to the new wards is perhaps one way of solving this problem.

Thirdly, it is much easier to acquire or appropriate adjacent land in these new residential areas than in the walled city. In the city people find it not easy to acquire adjacent property even from close kin.

Fourthly, many people find it convenient to live in the city, the first part of their lives working and saving towards a new home; one which is custom made to suit their wishes and aspirations, and one which they could proudly present as their life's achievement .

As to the area of Kano they prefer most, the response regarding the walled city is almost exactly the reverse of that regarding the wards. In this case most of the respondents were satisfied with living in the walled city , and only about 20 % showed an inclination given the chance, to live in the *Waje* area. Within the sectors, preference for the *Waje* area varied from 12.50% of the respondents from the south sector to 36.36 % of the respondents[145] from the east sector. Again the explanations for these are to be found in the socio-economic characteristics of the two sectors. One would expect the more traditional south sector to value the city environment more. On the other hand, it is not surprising that the east sector respondents would prefer to move out of the city, because as noted above, it is the densest and the most congested sector. Above all it is the most economically conscious of the four sectors, and relocating ward is one of the best ways of showing to one's peers that one has " made it ".

[145] This is the average between the male and the female response. However in many cases the females respond to the question by referring us to the *maigida* for an answer. In such cases we record the response of the *maigida* as for the *uwargida* also.

The response to the question about which part of the *Waje* area they wish to move to, was varied and many. Two things however stood out; the first is that *not a single respondent,* male or female, in all the houses sampled mentioned either ***Fagge*** or ***Sabongari*** . In fact some respondents were at pains to specifically exclude these areas from their choices. Reasons given for this range from social and cultural incompatibility to simple dislike. It should be remembered (supra § **3.2**), that ***Fagge*** has always been an area inhabited largely by the Hausa and non-Hausa Muslims from other parts of the nation, and from the neighbouring countries of Republic Du Niger, Chad and Cameroon. To the Kano indigine though, ***Fagge*** has invariably been associated with people of loose morals.[147] Similarly ***Sabongari*** has always been the domain of the non-Hausa non-Muslims from the Southern part of the nation.

The second thing to stand out , is that the most preferred areas were the new residential areas of ***Sheka, Dorayi*** and ***Kabuga*** to the south and west of the walled City, respectively. One interesting thing common to these areas is their spatial layout, which is a mixture of grid and non-grid like pattern. The reasons offered for these choices range from the availability of public amenities (electricity, pipe-borne water etc.), to good primary schools, all perhaps manifest exaggerations. However the main difference between these areas and the City wards is their proximity to the arterial roads that traverse the city, and for the most part the looser social bond.

To sum up while many people are not happy with the physical state of their houses, and not quite a few would rather change their locality, most would prefer to have these changes within the context of the environment they are familiar with . More importantly, most have little or no problem with the spatial quality of their houses.

7.3 Quotidian Space Utilisation

The quotidian use of space by domestic inhabitants is essential in understanding the form of habitation and its spatial patterning. Of major importance are those primary activities by which the house inhabitants interact among themselves and with non-inhabitants. These activities are of two types those, " that reflect socio-economic (or productive) status ... (and those)... that appear as persistent rituals... consistently across economic groups within society " (Howell & Tentokali 1989: 282). In reality the two are often times not clearly defined, but closely intertwined.

The pattern of daily space use is an indicator of the powerful mutual dependence of behaviour and space; space is defined according to, what Hillier and Hanson (1984:184) termed, the inner

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[147] The epithet of Fagge in rhythmic verse is:

Fagge; Faggen Wuta garin Lamaruzu
Garin Shege da Shegiya
Ko akwai na gari in ya kwan biyu
Kaji yace ," Ke yaki ! "

Meaning: Fagge; The suburb of Hell, City of Nimrod (the infidel)
The town of rascals male and female
None is upright but if so, after a while
He'll make a pass at some girl.

social logic of the society, but behaviour is also circumscribed by space (Hall 1959;1966). Sack (1980;70) posits that, " to explain why something occurs is to explain why it occurs where it does". To paraphrase him, to know what occurs in a place is to understand the value and significance of that place.

The quotidian use of domestic space could be looked at from three main perspectives, function, gender and age. The first is concerned with what happens where; the other two with who does what where, and the relationships and roles within the house.

7.3.1 Space Utilisation

It is extremely difficult to list all the activities that takes place in a domestic environment, but in essence domestic space could be defined as that physical space shared by family members for the purposes of eating, sleeping, living, socialising and in some cases even working. Domestic activities generally fall into two major groups, those that reflect social habits and those concerned with economic production. Activities concerned with the latter are relatively easier to distinguish from those concerned with the former .

Out of the myriad activities possible in a domestic setting, several usually stand out as the most common for a given milieu (Bechtel 1989:169 -171). Within the context of Hausa culture the predominant domestic activities are, religious or educational [148], personal hygiene, grooming, household maintenance,[149] activities to do with nutrition, economic, recreation, socialising, sleeping and procreation.

In considering activities that reflect social habits, only the use of space in relation to reception, living, eating and sleeping, out of the several possible activities were enquired upon (**Appendices 4 & 5**). The reasons for this are simple. Out of the multitude of activities, some have spaces specifically designated for carrying them out, and it is assumed that they are spatially circumscribed. Thus for instance, personal hygiene and food preparation are assumed to be restricted to the toilet, and the cooking place or hearth respectively. Such spaces are considered mono-functional , [150] or perhaps more appropriately functionally restricted, that is spaces not used most of the time and used for only certain specific activities. Some activities on the other hand have no designated spaces for carrying them out, but where they are conducted is determined by who conducts them and when. It is these spatially restricted activities that form the bulk of the quotidian activities in Hausa domestic settings.

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[148] In the traditional context most educational activities are closely related, if not entirely dictated by religious considerations.

[149] This refers generally to all activities that are carried in a house to make and sustain it into a neat and orderly environment. Specifically it refers to daily chores like cleaning, sweeping, washing up etc. It is not to be confused with the repair of the house fixtures or appliances (Howell & Tentokali 1989).

[150] Strictly speaking even these are not always monofuctional. For instance, it is not unusual to find a toilet also being used for body washing or bathing. Rather they are better described as functionally restricted spaces. These by definition are spaces that form the loci at which functionally related activities are performed (Kent 1992:6).

It would have been highly informative and interesting to enquire into the activity of procreation as a legitimate and specialised quotidian activity. However this was considered extremely personal and hence too sensitive to enquire into. Fortunately another activity closely related to it, sleeping, could be and was enquired about. Activities like , grooming, household maintenance, recreation and religious and educational were considered as part of quotidian living.

TABLE 7.3: SAMPLE RESPONSE ON QUOTIDIAN SPACE USE

Serial	Space	Reception %		Living (%)			Eating (%)			Sleeping (%)		
		M	F	M	F	C	M	F	C	M	F	C
1	**A**	86.69	0.00	59.45	0.49	20.94	47.73	0.00	10.50	12.29	0.00	19.81
2	**B**	9.35	0.16	8.95	2.25	2.81	10.55	0.67	2.25	9.79	1.89	0.02
3	**C**	0.00	5.66	1.55	39.64	53.35	1.42	25.37	47.62	0.00	9.79	6.72
4	**D**	1.70	36.76	7.84	40.49	16.76	10.10	46.85	27.0	4.54	21.50	21.97
5	E	2.26	57.42	22.21	17.09	6.24	30.20	26.98	12.63	73.38	66.82	51.48
6	X*	5	5	4	4	12	6	6	11	6	6	11
7	Y*	155	155	156	156	148	154	154	149	154	154	149
8	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* X : No Response
* Y : Number Of Respondents

Table 7.3 is a summary of the response on quotidian use of the space abstracted from the response to the questions on the quotidian use of space (**Appendices 4 & 5**) . Several things are easily discernible from it. First, it is seen that the dominant spaces are either gender specific or gender restricted; spaces that are predominantly used by a particular sex and rarely if at all, by the other sex are termed gender specific (Kent op.cit. :6) ; spaces utilised by either sex depending on the time, the occasion and even the location[151] are termed gender restricted. Thus for instance he *zaure* and the *tsakar gida* as examples of **A** and **B** spaces, are basically gender specific while the *rumfa* and the *ɗaki* as examples of **D** and **E** spaces, are basically gender restricted.

Second, none of the dominant spaces is mono-functional; on the contrary these spaces are for the most part multi-functional. Thus space B is used for receiving guests, as much as it is used for sleeping. Likewise space E is used for living, irrespective of gender or age, almost as much as it is used for eating.

Third, there is no dominant space that is not utilised by children[152]. If one assumes a balanced use of service spaces by the inhabitants then, the use of space by children is more evenly distributed than that by adults.

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[151] Generally the shallower a space is from the outside the more is it male oriented and the deeper it is from outside the more it is in the female domain.

[152]The Hausa classify children by age as follows; up to 6 months male offspring is called *jariri*; 6 month to 7 years is called *yaro*; 8 to 14 years is called *madaci*; 15 to 20 years is called *saurayi* and from the time he marries he

It is also possible to abstract from the same table how in general terms the principal characters utilise the main functional spaces. The result is presented in **Figures 7.1- 3** inclusive. First , it is seen that males use space **A** more than any other space for the major activities, except sleeping for which they utilise **E** space the most. Conversely in every case they utilise spaces **C** and **D** (in that order) the least.

Using a notation R, L, M and S for receiving, living, eating and sleeping respectively, and A, B, C, D, and E for the space types, one could summarise the male use of space as follows ;

R = A > B > E > D > C

L = A > E > B > D > C

M = A > E > B > D > C

S = E > A > B > D > C

From this it becomes clear that there are 3 distinct patterns of male use of space; one each for receiving and sleeping and one for both living and eating.

Secondly, it also becomes evident that for the four major activities females generally use spaces **D** and **E** the most, and spaces **A** and **B** (in that order) the least. Using the same notation as above the pattern of female use of space is as follows ;

R = E > D > C > B > A

L = D > C > E > B > A

M = D > E > C > B > A

S = E > D > C > B > A

This shows that there are only 2 distinct patterns of female use of space; one for receiving and sleeping and another for living and eating.

Thirdly, it can also be seen that the use of space by children exhibits a pattern that is markedly different from that of the adults. For children spaces and **C** and **D** are the most utilised, whereas space **B** is the least used. Using the above notation their pattern of space use is;

L = C > A > D > E > B

M = D > E > C > B > A

S = E > D > C > B > A

becomes *namiji* or man. The equivalent classification for females is up to 6 months, *jaririya*; 6 month to 7 years, *yarinya*; 8 to 11 years, *bera*; 12 to 16 years, *budurwa*, and from the time she marries she becomes *mace* or woman. Strictly speaking these last two categories are not children, but adults.

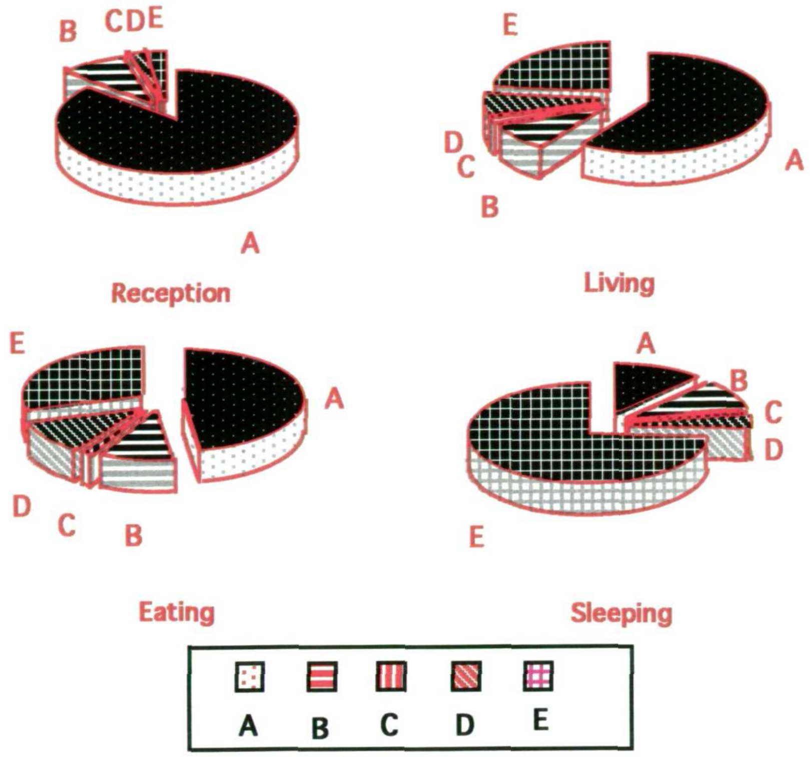

Figure 7.1 : Male Activity Patterns

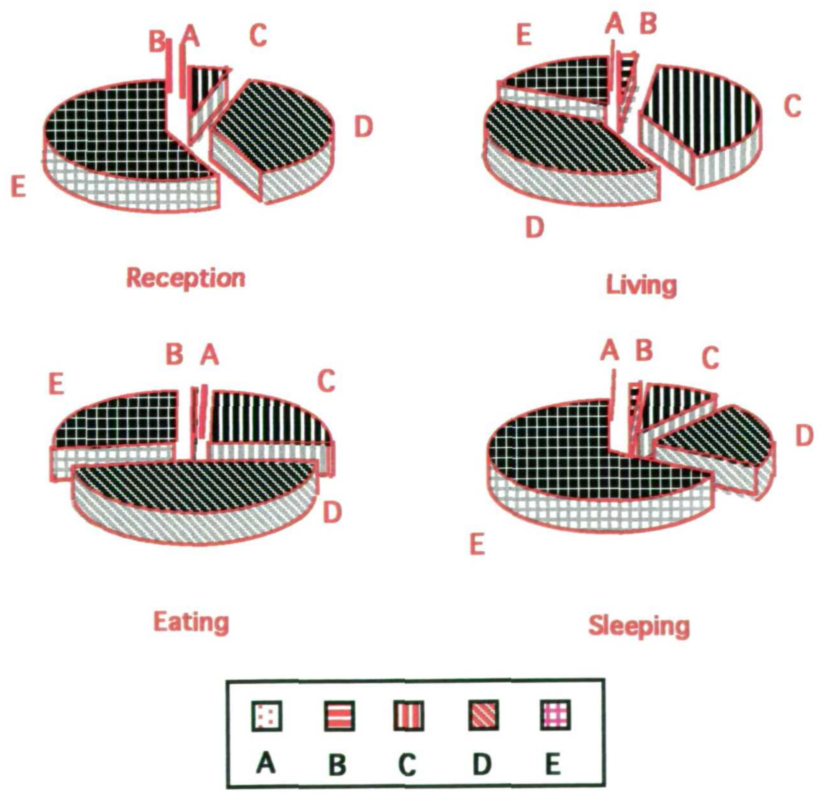

Figure 7.2 : Female Activity Patterns

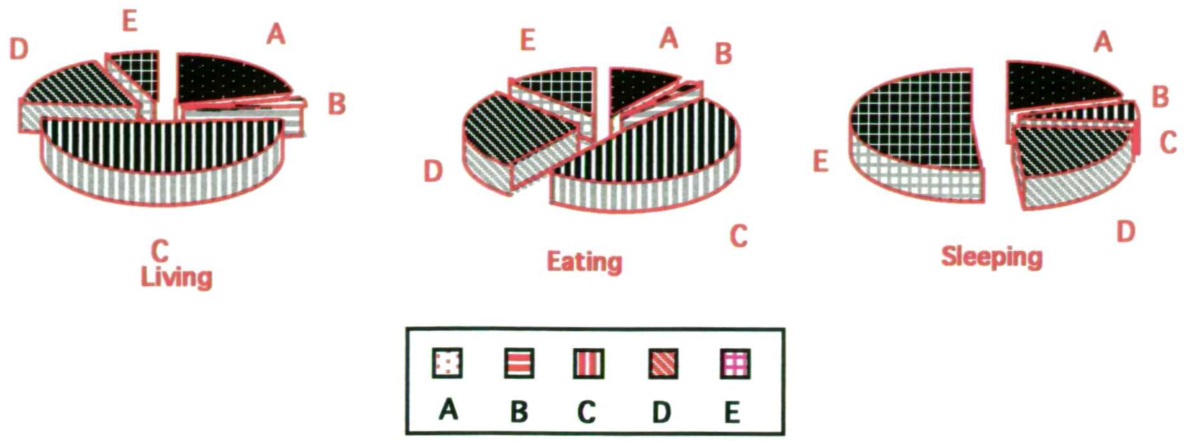

Figure 7.3 : Children Activity Patterns

This means that in the case of children there is a separate and distinct pattern for every activity. More significantly, none of these coincides with any of the patterns exhibited by the adults.
From the foregoing one could make two major inferences. The first is that spaces **A** and **B** are clearly male controlled spaces while spaces **C** and **D** are female controlled spaces. On the other hand space **E** is broadly speaking bipartite, even though for the most part, that is the waking hours, it is principally occupied and used by the female. The second inference considered highly significant, is rather salient and not immediately noticeable from the data. This is the observation [1] that there seems to be an interesting relationship between age and the use of space; the lower one's age, the less the restriction in the use of space, and vice-versa. Conversely, the older the child becomes, the more their pattern of space use becomes dependent on their gender (supra § **3. 4**).

Is the pattern of quotidian space use observed at the global level the same at the local level or are there differences ? To examine this the response on quotidian space usage of the 5 dominant spaces is presented separately with a breakdown of the responses by sector. Firstly reception ; although across the sample about 87 % of the male reception takes place in the *zaure*, it is clear there are significantly higher incidences of this in the south and west sectors (**Table 7.4**). In addition it is seen that more males are received in the *kofar gida* in the north and east sectors than in the other sectors or the city as a whole. Males it can be said categorically, never receive in the courtyard and very rarely in the *dáki* or *rumfa* . This statement is to be understood in its context. The average house in the sample has its *rumfa* adjoining a *dáki* which is usually a deep space from the outside. However there are houses with upper storey *rumfa* that are comparatively shallow from the outside (see for instance **House 102**) . In these houses it is not unusual for both the *dáki* and the *rumfa* to be used significantly by males. This use of *dáki* and the *rumfa* is more noticeable in the south sector (see below) .

[1] It was not possible while conducting the fieldwork to record the child use of space differentiated by their age. What is recorded here is a general tendency easily perceptible while in the field.

Similarly female reception generally takes place in the *ɗaki* or *rumfa* , 57.42 % and 36.76% respectively, but never in the zaure and extremely rarely in the kofar gida. The south and east sectors have the highest rate of female reception in the *ɗaki* and *rumfa* , approximately 61 % and 41.35 % of all reception respectively. because in most cases the *ɗaki* is the deepest space from the outside.

TABLE 7.4 : LOCAL AND GLOBAL RECEPTION PATTERNS

RECEPTION		A (Zaure) %		B (Kofar gida) %		C (Courtyard) %		D (Rumfa) %		E ('Daki) %	
		M	F	M	F	M	F	M	F	M	F
1	Sample	86.69	0.000	9.350	0.160	0.000	5.660	1.700	36.76	2.260	57.42
2	Arewa (North)	82.80	0.000	12.00	0.000	0.000	10.30	2.900	36.00	2.300	53.70
3	Gabas (East)	81.05	0.000	17.13	0.000	0.000	1.950	0.910	41.35	0.910	56.70
4	Kudu (South)	91.20	0.000	2.500	0.000	0.000	5.000	1.900	34.00	4.400	61.00
5	Yamma (West)	95.00	0.000	1.700	0.870	0.000	7.500	1.600	33.30	1.700	58.30

These results could indicate a strong inclination towards *kulle* or gender segregation (supra § **3. 4**) in the south sector. In social terms this means a higher degree of restriction of all non-kin males to the outermost spaces of the house. The higher than average use of the *ɗaki* for female reception in the south sector could also be explained as indicative of higher degree of *kulle* because in most cases the *ɗaki* is the deepest space from the outside. This is not surprising given that the south sector of the city is dominated by the nobility and the literati who put a higher premium on *kulle* . The use of the *ƙofar gida* in the east and north sectors would then indicate 2 things; either a corresponding relaxation in the rules of *kulle* or more of those received are close relations.

Secondly living pattern and this is presented in **Table 7.5**. Generally adult males use the *zaure* (59.45 %) or the *ɗaki* (22.20 %) for living. There are however noticeable variations. The *zaure* is used for living significantly more in the north sector compared to the other sectors or the sample as a whole. Males use the *ƙofar gida* for living, appreciably more in the east sector than the other sectors. A possible explanation for these observations is the fact that more people earn their living, in or close to their homes in the east and north sectors. In contrast the use of *ɗaki* by males is higher in the south and west sectors.

The use of *rumfa* for living by males is rare. The exception is the south sector which is perhaps attributable to their higher use of the upper storey *rumfa* . Generally adult males almost never use the courtyard for living. This is to be expected since in accordance with the Hausa custom, no self-respecting adult male stays inside the house during the day. The comparatively high figure

TABLE 7.5: LOCAL AND GLOBAL LIVING PATTERNS

LIVING	A (Zaure) %			B (Kofargida)%			C (Courtyard) %			D (Rumfa) %			E (Ɗaki) %		
	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch
Sample	59.45	0 490	20.94	8.950	2.250	2.810	1.55	39.64	53.35	7.840	40.49	16.76	22.21	17.09	6.240
Arewa (North)	72.70	0 .00	28.80	9.300	0 .00	0 .00	0 .00	42.4	53.00	4.40	40.90	12.80	13.60	16.70	5.400
Gabas (East)	58 40	0.480	18.50	15.40	4.80	5.000	3.30	41.35	54.00	7.00	41.35	18.50	15.90	12.02	4 .00
Kudu (South)	51.30	1.300	18.80	1.900	1.300	4.200	0.000	37.80	54.20	14.70	37.20	11.00	32.10	22.40	11.80
Yamma (West)	58.30	0 .00	19.17	6.700	1.670	0 .00	0 .00	34.17	51.66	4.20	44.16	25.00	30.80	20.00	4.170

recorded for male courtyard living in the east sector is an anomaly which is largely attributable to **House 2**. This as noted (supra § **5.2**) belongs to a single widower who lives alone.

Women and children mostly use the courtyard and rumfa for living almost uniformly across the sectors, but there is a comparatively higher use of *rumfa* and *ɗaki* for living by children in the west and south sectors respectively . One aspect of the data recorded needs further explanation; this is the use of *zaure* and ƙofar *gida* for living by females. As observed in Chapter 5, in many of the houses an inner *zaure* is used as a place for cooking especially the inner *zaure* or *soro* that opens directly onto a courtyard. It is in such houses that the *zaure* is used for living in conjunction with the courtyard.

Thirdly the pattern of quotidian eating and this is presented in **Table 7.6**. Generally adult males use *zaure* and *ɗaki* for eating, and to a lesser extent *rumfa* and *ƙofar gida* . In the north and west sectors adult males use the *zaure* for eating considerably more in comparison to the other sectors

TABLE 7.6 : LOCAL AND GLOBAL EATING PATTERNS

EATING	A (Zaure) %			B (Kofargida) %			C (Courtyard) %			D (Rumfa) %			E (Ɗaki) %		
	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch
Sample	47.73	0 000	10.50	10.55	0.670	2.250	1.420	25.37	47.62	10.10	46.85	27.00	30.20	26.98	12.63
Arewa (North)	59 00	0 000	9.400	8 500	0 000	0.000	2.200	30.30	56.30	5.300	47.00	26.50	25.00	22.70	7.800
Gabas (East)	40 00	0.000	10.50	15.74	0 960	2.500	2.840	23.10	46.00	14 02	50.50	33 00	27.40	25.44	8.000
Kudu (South)	41 00	0 000	12.80	5.000	0 000	6.100	0.000	16.60	35.10	12.70	41 70	15 50	41 30	41.70	30.40
Yamma (West)	57.50	0 000	6 670	8.340	1.670	0.000	0.000	31.66	57.50	5 830	50.00	31.36	28.33	16.67	4.160

or the sample as a whole. On the other hand there is a markedly more use of the *ƙofar gida* for eating by males in the east sector. This is not surprising since the use of *zaure* and *ƙofar gida* for living is comparatively higher in the north and east sectors respectively. It appears eating and living patterns invariably coincide which shows that culturally eating is perhaps to be considered as an extension of living.

The *rumfa* and the courtyard are the preferred places for eating by women and children respectively. The exception is the south sector where men and women utilise the *ɗaki* as much as the *rumfa* , and children use the *ɗaki* more than the *rumfa* . In the south sector too, males use the *ɗaki* for eating as much as they use the *zaure* . Also as is the case with living, we note an anomaly in the eating pattern; that is the use of courtyard for eating by male adults in the north and east sectors. This is attributable to **House 1 & House 3** , the two non-family houses (supra § **5.2**).

TABLE 7.7 : LOCAL AND GLOBAL SLEEPING PATTERNS

SLEEPING	A (Zaure) %			B (Kofargida) %			C (Courtyard) %			D (Rumfa) %			E (Ɗaki) %		
	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch	M	F	Ch
Sample	12.29	0.00	19.81	9.79	1.89	0.02	0.00	9.79	6.72	4.54	21.50	21.97	73.38	66.82	51.48
Arewa (North)	6.400	0.000	26.60	11.50	7.200	0.000	0.000	21.20	10.20	6.800	23.40	23.40	75.30	48.20	39.80
Gabas (East)	20.55	0.000	22.00	16.75	0.000	2.000	0.000	8.190	3.000	2.300	20.21	24.00	60.40	71.60	49.00
Kudu (South)	9.500	0.000	14.90	1.300	0.000	5.400	0.000	7.700	8.800	6.900	11.50	8.800	82.30	80.80	62.70
Yamma (West)	8.330	0.000	15.00	7.500	1.670	0.000	0.000	3.330	6.670	2.500	28.33	28.33	81.67	66.67	50.00

Fourthly sleeping pattern; generally the *ɗaki* is the preferred place for sleeping irrespective of gender or age (**Table 7.7**). There are however noticeable differences in the choice of secondary place for sleeping. For adult males *zaure* and *ƙofar gida* are the preferred places, particularly in the east sector. Males never sleep in the courtyard even in those houses where there are no females. This is not to say that males do not sleep or like sleeping in the open, they do. However in most cases this happens in the *ƙofar gida* or in the open terrace called *kwatashe* found in the upper storey, for instance in **Houses 75 & 79** . Where possible one of the flat roofs in the house is also used , for instance **Houses 104 &135**. In addition it is customary for adult males and the youth to sleep the early part of the night outside on the street, particularly in the *bazara*, the hottest season of the year (supra § **3. 1**).

In contrast to the case of males, females never sleep in *zaure* or *ƙofar gida* . The preferred secondary sleeping place for women is the *rumfa* and the courtyard. However there are cases where an inner *soro* or *zaure* opens onto a courtyard on both sides making it comfortable and convenient to sleep in . It is such cases that account for the recorded figures of women using the *ƙofar gida* for sleeping in the north and west sectors. Women mostly use the courtyard in the same way as adult males use the exterior, that is only for sleeping in the early part of the night when the weather is very hot . This is more prevalent in the north sector than anywhere else.

Children use *rumfa* and *zaure* the as secondary places for sleeping. As noted above the older the child the more the tendency for its quotidian use of space to approximate to that of its gender. Thus young male children of between 4 - 9 years of age would sleep in the *rumfa* while those older than 9 would be more likely to sleep in the *zaure* . Male children would sleep in the rumfa while would be more likely to sleep in the zaure . Female children over 4 years of age would sleep in the *rumfa* until they are old enough to share a room with an older female relative, usually an aunt or a granny. Given this disposition and the fact that a higher than average percentage of children in the north and east sectors use the *zaure*. and the *ƙofar gida* for sleeping, one could conclude the children in these sectors are comparatively older than children in the other sectors.

In sum then one could safely conclude that the 4 quotidian activities delineated are niether socially convergent nor coextensive despite the fact that in many cases they are spatially coterminous. Most male quotidian activities, with the exception of sleeping, take place in the outer parts of the house while females use the inner parts of the house. On the other hand children's quotidian activities are more evenly spread depending on their age. Finally, the pattern of quotidian space usage exhibited globally is very similar to that exhibited locally.

Next we turn to the use of space for socio-economic purposes . Hausa women nowadays for certain, and perhaps even from early times, have the largest share of their economic activities conducted within the house. These economic activities tends to be gender restrictive for most of the time and gender specific at other times. For this reason it might be more profitable to discuss the socio-economic use of space under space and gender.

7.3.2 Space And Gender

What does the data from the sample say about gender relations ? Again looking at **Table 7.3** one immediately notes that it is also essentially about the use of space by gender. The inhabitants response to the socio-economic part of the questionnaires is presented as **Appendix 13** . A summary of the relevant data for each of the 4 sectors was abstracted from this and presented as **Table 7.8**.

Several statements about gender and space could be made from these sources. First, in relation to economic production, space utilisation by gender differs markedly from that of social reproduction. On average less than 15 % of the male respondents work at home, compared to about 70% of the women respondents who are engaged in some economic activity or other [153]. Females who work away from home constitute less than 3% of the 70 % respondents engaged in some economic activity [154].

153 It should be noted that not all these economic activities are big and successful enough to be self-supporting. For most they are means of ensuring a steady flow of petty cash to meet everyday needs.

154 Most of these work as primary school teachers or day care nurses. None work as secretaries or such like in an office.

Second, the pattern of use of the dominant spaces could not be more disparate. Almost all the males who work at home use spaces **A** , that is the *zaure*, except for the very few who use the immediate exterior of the house (the *farfajiya* or *haraba*)[156]. On the other hand female economic endeavours pervade all dominant spaces [157]. On average half of all female economic activity is carried out in space **C**, that is the *tsakar gida* or courtyard , while about one third is carried out in spaces **D** and **E**, that is *rumfa* and *ɗaki* respectively . With slightly less than 20 % of all economic activities conducted therein, spaces **A** and **B** are economically used the least (**Table 7.8**). Thus as far as domestic space is concerned, females can and in many cases do intrude upon spaces socially considered male spaces. Sometimes they even appropriate male spaces, for economic production or endeavours.

TABLE 7.8: SUMMARY OF SPATIO - ECONOMIC CHARACTERISTICS

Sector	PEOPLE WORKING AT HOME				
	MALE	FEMALE			
	% Of Total Using Space A	% Using Spaces A/B	% Using Space C	% Using Spaces D/E	% Of Total Working
Sample	14.37	18.75 2.680*	51.78	29.46	70.00
North	25.70	8.000	56.00	36.00	71.43
East	10.91	12.19	46.34	41.46	74.55
South	5.000	30.77 11.54*	42.30	15.38	65.00
West	20.00	15.00	70.00	15.00	66.66

*[158] See note (158).

Table 7.8 also shows some interesting sector differences in terms of use of space for economic purposes. To begin with it is not surprising that the south sector, the domain of the Kano elites has the lowest percentage of men who work at home. The figure for the east sector is also comparatively low, but is explained by the fact that many artisans from this sector have their work-place in the great Kurmi market nearby.

Another striking result discernible from the table is that the south sector has not only the highest percentage of females who work in spaces **A** and **B**, but that all the females who work outside the home are from this sector. This is perhaps because this sector has more people with western education than any other.

What of the use of spaces **C**, **D** and **E** ? The west sector stands out as having the highest percentage of women who utilise space **C** and the lowest percentage of those who utilise spaces **D**

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[156] Most of those who work at or near the home were engaged in tailoring, smithing and canteen or shop keeping.
[157] The dominant female enterprises are, food processing, catering, leather works, petty trading etc. etc.
[158] This is the percentage of women who work outside the home { This figure is percentage of percentage; for example 11.54% of 65% of the females in the south sector work away from their homes. Therefore 19.23 % (30.77 - 11.54) Of 65% of the female respondents work in space A or B .

and E. Conversely the east and north sectors have the highest percentage of women who utilise spaces D and E. This result is understandable if one takes into account of the fact that for each of the economic activities undertaken by Hausa women there is usually the best place to conduct it . Thus for instance food processing is mainly carried out in the courtyard or inner *zaure*, while craft work is carried out largely in the *rumfa* and to a lesser extent even in the *ɗaki*. What this result indicates is more the balance between the different types of economic endeavours conducted since across the sectors, the percentage of women who work is virtually the same.

What could one infer about gender relations from these observations on the use of space ? Much has been written about male-female relations in non-western societies . Underlying most of these writings are two dominant ideas; the idea of privacy and the idea of status. Privacy, as one scholar laments (Sciama 1993:90-92), eludes clear definition. It is indeed recognised as a complex word, and has therefore been defined severally (Williams 1988:242). However, in the literature two definitions stand out; "the ability to *control* information about one self" and "the ability to create boundaries that *exclude* others" { emphases added } (Howell & Tentokali op. cit. :281). Thus the segregation of the sexes and the subsequent distinction, between male and female spaces is seen as the mechanism of control, by which overt female oppression is institutionalised (Callaway 1984:429).

Status is another complex word (Williams op.cit.: 299), but regardless of definition the protagonists of this idea maintain that, "women and men are spatially segregated in ways that reduce women's access to knowledge and thereby reinforce women's lower status relative to men's" (Spain 1992:3). This spatial segregation of sexes which derives largely from the differentiation of roles, leads to female deprivation and oppression.

However not all scholars hold such strong feminist views. Some have mooted the idea that in any community, " women experience the world differently from men....{that is }....their social constructions and their experience of the world must often (but not always) differ fundamentally " (Ardener 1993: 19-20). Consequently in many societies women tend to have a value system separate and independent from, but not in direct opposition to the dominant paradigm, enabling them to function in a complementary relation. In such communities, women are best seen as a 'muted group'. Some others have put forward the concept of 'female power', that is the separation of roles and the concomitant segregation of women, far from depriving women has indeed put women at an advantage, in terms of prestige, personal satisfaction and the ability to manipulate men. Of course feminist scholars are quick to label this argument as a rationalisation of the status-quo (Callaway 1984:430).

While discussing Hausa ethnology (supra § 3.5), mention was made of the strict division of labour by gender and the fact that, public mixing of the sexes is not accepted in Hausa society. The Hausa norm for social intercourse, like most Islamic sub-cultures, dictates that males and females can mix socially, and share the same physical space freely, only if a marriage bond exists between them or if there can never be a marriage bond between them[159]. For this reason women do not go out of their homes in the day time except when absolutely necessary. Thus women of marriageable age do not go to the market or anywhere where there is the likelihood of indiscriminate mixing of the sexes [160].

These facts considered together with the data on the use of domestic space could be taken as evidence of the absolute control and suppression of the Hausa female. With this at the background one can re-examine the idea of privacy and the idea of status; one deriving from the relationship to the means of production and the other from 'social estimation of honour', in the context of Hausa gender relations.

First the idea of privacy. In most literature dealing with cultures under the sway of Islam, the notion of domestic 'privacy', as the control of women by segregation and seclusion is stressed (Ardener op. cit.; Bechtel op. cit.). But as Khatib Chadidi (1993: 112) rightly pointed out, most of the writers are ignorant of the underlying principles upon which spatial segregation of the sexes is based. More importantly perhaps is the fact that the rules of segregation apply to both males and females. In Hausa society for instance, a person does not have free access to his married sister's quarters without the express permission of her husband, even where she is the only wife in the house. Spatial segregation restricts the male as much as it restricts the female.

Another implication of spatial segregation is that the affairs of women are largely separated not only physically, but particularly emotionally, from the affairs of men. This translates into the independence of women from men in a very profound way. It is this observation which Callaway (op. cit. 433) to conclude that in Hausa society at least, " Women can conduct their lives with an independence for which there is no recognition in the 'dominant model'", i.e. the western male-female relation paradigm. Thus the idea of 'privacy' as control seems fallacious.

Lack of, or at best low social status, is another aspect of gender relations that has been focused upon by many social scholars. As Spain (1992: xiv) observed, most feminist writings hold that , " women's status is lowest in societies in which housing is sexually segregated". Spain (ibid.: xv) has delineated three aspects of the measure of status, namely control of labour, property and participation in public life.

Hausa culture as we have noted (supra § 3.5), recognises the right of women to the fruits of their labour. A man has no right over the labour of his wife; he could neither command nor control it. In fact it is considered the height of social disgrace, especially in urban Hausa, for a man to allow

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[159]For example, trusted male servants are also allowed to share the same physical space with the adult females of a house (Q 24: 31).

[160]This is concept of gender segregation is modified though, by the Hausa system of social hierarchy by age. For instance, although a person has free access the inner parts of the house of an elder brother, the reverse is not true.

his wife to be engaged in any type of labour, other than what is considered appropriate for females to be engaged in[161]. Despite the fact that a high percentage of the women in the houses surveyed are engaged is one economic activity or another, most Hausa men would prefer to remain in abject poverty rather than ask or allow their wives to work in the farm or the factory. A fact that has invariably intrigued those studying Hausa culture; it still does (Callaway op. cit. :442). Similarly, women have absolute control over properties belonging to them, especially the property acquired through some economic activity, and could dispose of any property in the way they deem fit (Callaway op. cit. :440 ; Schildkrout 1978; 117).

Finally, participation in public life. Strictly speaking this does not come under the domain of domestic space and perhaps should be of no consequence here. But it seems appropriate to carry the discussion to its logical conclusion. If by public participation is meant putting priority on pursuing a career or working away from home, then it is true Hausa women do not participate in public life. If however it is meant economic participation or the ability to form or break associations with others of their sex, then Hausa women do participate in public life (Smith 1965; Hill 1977; Schildkrout 1978; Callaway 1984). Looked at this way Hausa women do not lack self-esteem since it is generally accepted that control of economic resources is the sine-qua-non of social status[162].

7. 4 Summary

From the data and the discussion on gender relations certain conclusions could be drawn about the quotidian use of domestic space in Hausa society. First, most spaces are gender restrictive rather than gender exclusive. Thus except for two spaces, the *zaure* or outer hall for males and the *tsakar gida* or inner courtyard for females, no space is gender exclusive. Generally the deeper a space is from outside, the more male restricted it is, especially during the day. For females the reverse is also true.

Second, spatial restrictions apply to both sexes, although within the house more to males than to females. Spatial restrictions as a rule do not apply to children, and they could said to be really spatially open. As they get older they tend to lo se this characteristic.

Third, where females are engaged in some economic production , and this is usually the case, they could encroach on what may be said to be the more female restrictive spaces, but the reverse is not true. That is economic activities stretch the extent of female spatial control. Fourth, the *ɗaki* or room seems to be a multi-functional space and the most intensively used in the house, that is more

161 According to the strict letter of the *Shari'a*, Islamic orthopraxy, the only labour expected of a female by her husband is that necessary for family cohesion , for example child nursing and socialisation, or that which is customary, for instance, cooking. However some scholars like the late Sheikh Abubakar Mahmud Gummi, hold that even cooking is not expected of a woman without her consent, since the relevant text of the Qur'an enjoins men to *feed and clothe* their wives. Thus he argued that mere provision of raw or unprocessed food or unsewn cloth does not fulfil this socio-religious obligation.

162 Callaway (1984: 431) was surprised to learn that, " these women are in fact typically outspoken, articulate, sometimes opinionated, and generally quite acutely aware not only of their immedeiate environment but of the outside world as well. "

people utilise it. It is also the most socially exclusive space in the house. Paradoxically it is both the place for the most intimate activity, procreation, as well as the place for receiving honoured guests. On the other hand another multi-functional space, the *tsakar gida* or inner court, is the most extensively used space, that is more activities are carried out here, and the most socially inclusive. Thus the *ɗaki* is to the house what the *unguwa* or ward is to the urban fabric. Similarly, the *tsakar gida* is to the house what the market is to the urban milieu.

CHAPTER EIGHT: SYNTACTIC ASPECTS OF THE HOUSE

8.1 Spatial Configurations

Architecture is more than shelter, of that not many would dispute. In addition to shelter, architecture involves the social and the symbolic definition, generation and transformation of space. Inhabited spaces are never neutral. They are cultural constructions of one kind or another and the way space is organised bears on the socio-cultural disposition of the inhabitants. That is, the arrangement of space contain statements about social and political relations, kin relations, distributions of power, and cosmological concepts - ideas of the sacred and the profane. That this is so has been argued and demonstrated in many studies for many societies (Rapoport 1969; Glassie 1975; Aradeon 1981; Hanson & Hillier 1982 Hillier & Hanson 1984). A full understanding of any given culture is incomplete without an understanding of how its inhabited space is organised. Put another way, an analysis of the spatial organisation of a given society is the most expedient means of investigating its socio-cultural paradigms.

Having examined the physical form and certain socio-cultural aspects of the houses in the preceding chapters, the next logical step is to look at the spatial configuration [162], or the pattern of space arrangement within the houses forming the sample.

Commenting on the changes in the architecture of Kano Sa'ad (1989:72) stated that, "the material of construction may have changed, but the spatial conception......still persists in most (sic) residence." This spatial conception is the essence of architecture, because the form that space is given is a statement of both individual and social values and tastes; values as in ideas which are held true and tastes as in things which are given preference.

Spatial configuration is the primary, though not the exclusive, means by which these social ideas and concepts are expressed, and as earlier defined (supra **§ 4.2**), configuration is, " the relation among spaces in a complex taking into account all other spaces in the complex " (Hillier et. al. 1987:363). This is one of the central ideas behind the Space Syntax theory.

There are several measures for determining spatial configuration , but the primary measure of spatial configuration is the syntactic *integration* / *segregation* continuum. The analysis of spatial configuration involves an examination of spatial characteristics, and spatial hierarchy in a given sample. Spatial characteristics are those aspects of a space that define it in relation to the spatial system to which it belongs, for instance its depth from without the system . Spatial hierarchy on the other hand, deals specifically with the integration pattern in a sample of spatial systems, in this case the houses from Kano City.

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162 There is a fundamental difference which needs to be emphasised between spatial relation and spatial configuration. The former exists where there is any type of link between two discrete spaces and the latter where the link between two discrete spaces is considered given a third, fourth or n-th space (See Hanson & Hillier 1992).

This chapter will therefore examine the spatial morphology of the houses surveyed using the tools of space syntax. The main objective of the chapter is to identify the basic spatial morphology of the Hausa house. To this end it will address itself to the following questions; What are the distinguishing spatial characteristics of the houses ? In what way are the main functional spaces within each house ordered ? How do the spatial characteristics of the main functional spaces relate to those of the house as an entity ? How are the spaces syntactically differentiated ? What would explain the spatial characteristics so observed?

Appendices 17 &18 present the basic syntactic parameters of all the houses in the sample. All the relevant data used in the following analysis are extracted therefrom.

8.2 Spatial Characteristics

The spatial characteristics of a house derive from certain syntactic measures. These include the nature of the justified graph; syntactic size, that is the number of convex spaces in the system, syntactic depth, connectivity, control and the RRA values of the system. It also includes the degree of spatial differentiation within the complex. In this section only the basic parameters of these measures will be looked into. However in subsequent sections and sub-sections, the various relationships within and across these measures will be treated in detail.

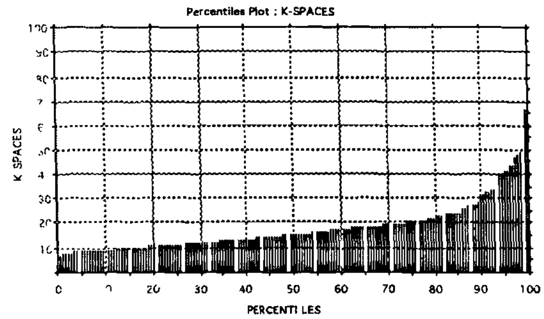

Figure 8.1 : Distribution Of Syntactic Size In The Sample

While presenting the houses in the sample, they were classified both by the number of families accommodated and by the number of their convex functional spaces. In addition the justified graph of each house was drawn with the exterior as root (supra § **5.1**). In effect then two of these spatial parameters have already been considered. It will thus suffice here to summarise the characteristics of these parameters .

Syntactically the sizes of the houses in the sample range from 6 convex functional spaces (K-sps) to a maximum of 98 K-sps. The mean syntactic size is 18 Ksps. However, as the Percentile distribution shows, approximately 60% of the houses, fall into the 10 to 20 Ksps group (**Figure 8.1**). Expectedly most of the houses with less than 10 K-sps are fragmented houses while most of those at the other end of the spectrum are multi-family or "Big" houses (See supra **Chapter 5**) .

TABLE 8.1 : MEAN DEPTH MEASUREMENTS

Justified Graph Type	Mean Depth Parameters						
	Min	Max.	**Mean**	Std Dev.	Coeff Var.	Kurt.	Skew
All Houses (N=160)	2.400	7.502	**4.430**	0.960	21.67	0.278	0.570
Tree-like (N=132)	2.400	7.502	**4.453**	0.949	21.32	0.557	0.667
Ringy (N=28)	2.500	6.250	**4.323**	1.019	23.56	-0.949	0.228

Technically justified graphs are either asymmetrical or symmetrical , in other words deep or shallow, and they may also be tree-like or ringy. An examination of the justified graphs described by the houses shows that over 80% of the houses in the sample have tree-like justified graphs [163], varying from the bushy and flat to the deep and vertical. Only 28 houses , that is 17.5% of the houses in the sample exhibit rings in their justified graphs (supra § **5.3.2.**).

What could we say about the syntactic nature of these justified graphs ? The degree of verticality or flatness of a justified graph is given by the measure of its mean depth (MD). The MD of a graph is at minimum when the all the nodes in the graph are at depth 1 from the root, i.e. bushy. The value is at maximum when all the nodes in the graph are arranged in a chain one above the next, i.e. tree-like [164] (Kruger 1992).

TABLE 8.2 : SECTOR MEAN DEPTH MEASUREMENTS

Sector	Mean Depth Parameters						
	Min	Max.	**Mean**	Std Dev.	Coeff Var.	Kurt.	Skew
All Houses (N=160)	2.400	7.502	**4.430**	0.960	21.67	0.278	0.570
North (N=35)	2.668	6.568	**4.313**	0.959	22.23	-0.101	0.450
East (N=55)	2.400	6.480	**4.310**	0.836	19.34	-0.056	0.315
South (N=40)	2.998	7.502	**4.660**	1.174	25.20	-0.261	0.658
West (N=30)	2.500	6.037	**4.482**	0.836	18.66	-0.485	-0.011

An examination of the MD values for all the houses reveals that these range between a minimum of 2.400 and a maximum of 7.502, with a mean of 4.430 (**Table 8.1**). The MD values of the houses with tree-like justified graphs are not significantly different from those of the sample as a

163 A graph is tree like if its nodes are minimally connected, i.e. it has the minimum number of connections without closed paths or rings. Thus by definition a tree like graph with k nodes has k-1 connections.

164 However this value decreases with increasing number of nodes or k value. But for most domestic spaces the measure of MD is a fairly accurate indicator of the graphs verticality.

whole. Interestingly the mean MD value of the houses with rings is only slightly lower than both the mean MD of the sample and that of the tree-like houses.

A similar result is obtained when the houses are considered sector by sector, that is the mean MD values for the respective sectors do not vary much from that of the sample or from one another (**Table 8.2**). However significant variations are noticeable when the houses are considered by family size (**Table 8.3**). Thus while the single family and the 2-family houses have mean MD values that are very much closer to the sample mean of 4.430, the MD value for the 3-family houses is lower than that of the sample. Contrarily the mean MD values for the 4-family and the ≥5-family houses (5.008 and 5.329 respectively), are considerably higher than that of the sample.

This indicates two things; first houses become deeper as the number of families increases: of course this is subject to the limiting effects of the properties of the justified graph (See supra note 164) ; secondly, the nature and position of the rings may have little or no effect on the configurational disposition of the houses .

TABLE 8.3 : MEAN DEPTH BY FAMILY SIZE

Family Size	Mean Depth Parameters						
	Min	Max.	**Mean**	Std Dev.	Coeff Var.	Kurt.	Skew
All Houses (N=160)	2.400	7.502	**4.430**	0.960	21.67	0.278	0.570
1-Family (N=103)	2.400	7.502	**4.389**	0.997	22.72	0.585	0.752
2-Family (N=31)	2.688	6.568	**4.272**	0.845	19.79	0.426	0.512
3-Family (N=8)	3.001	4.733	**3.913**	0.646	16.50	-1.471	-0.066
4-Family (N=9)	4.445	6.037	**5.008**	0.489	9.762	0.216	0.861
≥ 5-Family (N=9)	3.682	6.2700	**5.329**	.821	15.41	-0.181	-0.778

What could we say about the location and nature of these rings ? There are 4 possible types of rings ; internal or external ring and trivial or non-trivial rings. A ring is considered non-trivial, if breaking it would result in making the resultant justified graph of the house at least one level deeper or would result in isolating one or more parts of the house. Conversely it is considered trivial if breaking it would have little effect on the justified graph or the overall configuration of the house. Most of the rings are external and trivial. However nine houses in particular, namely **Houses 86, 88, 94, 98, 100, 101, 133,159** and **160** exhibit rings that are non-trivial.

In real terms what is the effect of these rings ? That is , what is their significance at the level of everyday experience ? In many cases these rings reflect the link between the outer room, called the *shago* [165] and an interior space for instance the *kofar gida*, or an exterior space for instance the *zaure*, as the case may be. Six cases deserve special attention; these are **Houses 94, 98, 99 , 101, 133, 159** and **160**. Except for the last two all have more than a single ring, with **House 98** exhibiting 3 rings. The internal ring in **House 94** links the upper storey private apartment (*turaka*) of the *maigida* with the rest of the house, by means of a secondary *zaure*. Similarly the ring in **House 101** links the outer reception room of the *maigida* with the rest of the house. The ring in **House 133** connects two houses belonging to two brothers, by means of an inner connecting door, called *madudduka* (supra **3.3**).[166] But although these houses are considered as a single house with 2 sections, to all intents and purposes they are practically independent of each other. Similarly the (external) ring in **House 159**, and the (internal) ring in **House 160** connect a *sashe* , i.e. a part belonging to one of the adult children of the house with the main family house.

Thus one can see that these rings are without exception the result of additions of door ways, or in the case of **House 94** a hall way. Does this mean that these rings are incidental, i.e. unplanned or non-essential, rather than conceptual, that is a substantive and in some cases even an essential requirement ? In other words are they but more the result of fine-tuning existing configurations ? Perhaps in contemporary times this is so, but traditionally the *shago* serves the *maigida* as a work place, a storage space and if he belongs to the literati, a study. In the past the *shago* had been, and even today in some rustic communities is , to the urban poor what the *turaka*, (the private quarters of the *maigida*) is to the nobility and the urban rich. In such cases then, the door linking it to the rest of the house is provided for in principle rather than incidental. From the foregoing it could be deduced that the presence of the rings as they exist now, does not make the ringy units very much different from the tree-like units. It remains to be seen if the rings are syntactically significant when other measures are considered.

Two other measures that help clarify the syntactic nature of a house are connectivity and control; connectivity measures how well connected a space is , while control measures the relation of the space to its immediate neighbours (Hillier & Hanson 1984: 103-109). Both are thus concerned with the local as opposed to the global disposition of a space. For a given system connectivity is closely related to control.

Minimum control values for all spaces in the sample range between 0.100 to 0.500 with a mean of 0.212, while maximum control values range between 1.333 to 8.500 with a mean of 3.738. However, since control values measure the local disposition of a space it is only meaningful if spaces are considered individually. By definition control values less than 1 indicate spaces with

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165 **House 98** has a western type living room which the inhabitants call *falo*, rather than a *shago*, but it serves the same purpose as does a *shago*. Similarly the ring in **House 99** links the main house with a stable rather than a *shago*.

166 The idea for this type of door may have been borrowed from the sedentary Fulani practice of providing a connecting door between two separate houses belonging to two agnates (David 1971: 117). It is now more or less extinct, especially in urban areas.

weak control, whereas values greater than 1 indicate spaces with strong control. Of the 2884 spaces, 1801 (or 62.45 %) have less than 1 control values and 990 spaces (or 34.33 %), have greater than 1 control values ; in only 93 cases (or 3.22 %) do we have control values exactly 1. Thus almost two-thirds of the spaces are weak control spaces.

As a rule the minimum connectivity of any space in a system is one. The maximum connectivity recorded for the houses in the sample ranges from 2 to 10 connections. In most of the cases though, the maximum number of connections are 4 or 5. The distribution of space connectivity across the sample is presented in **Table 8.4** From this it is seen that majority of the spaces are only minimally connected further confirming what has already been stated about the tree-like nature of the houses.

TABLE 8.4 : SPACE CONNECTIVITY ACROSS SAMPLE

Spaces With Connectivity	Count (N=3044)	Percentage Of Total
1	1454	50.416
2	777	26.942
3	353	12.24
4	154	5.34
5	81	2.809
6	36	1.248
7	17	.589
8	6	.208
9	4	.139
10	2	.069

But how are the main individual spaces connected. In other words what is the local disposition of each functional space? **Table 8.5** shows the space connectivity of all the main space types found in the sample. The most connected functional space is the courtyard. Its mean connectivity is 4.35. The functional space with the least connectivity is the *ɗaki* (room), which in most cases is only singly connected. Of course the service spaces , namely the toilet (*banɗaki*) , the cooking place (*madafi* or *kicin*) and the storage rooms are also mostly singly connected, and only rarely exceed this level of connectivity. Two functional spaces, the outer yard (*ƙofar gida*) and the entrance hall (*zaure*) invariably have connectivity greater than one. For the most part though their connectivity is 2. Exhibiting similar characteristics to these are two service spaces, the stairways and the transition spaces. These too, for the most part also have a connectivity between 2 and 3.

One important deduction that comes out from this is that the local disposition of the functional spaces tends to reflect their global disposition. Thus the most connected spaces are also the most integrating spaces, while the least connected spaces tend to be segregated spaces. This is attested to

TABLE 8. 5 : SPACE CONNECTIVITY TYPE

Basic Space	Connectivity Type (N=2884)														
	Space Connectivity 1 (N=1454)			Space Connectivity 2 (N=777)			Space Connectivity 3 (N=353)			Space Connectivity 4 (N=154)			Space Connectivity ≥ 5 (N=146)		
	Count	% Of Count	% Of Total Spaces	Count	% Of Count	% Of Total Spaces	Count	% Of Count	% Of Total Spaces	Count	% Of Count	% Of Total Spaces	Count	% Of Count	% Of TotalSpaces
Zr (Zaure)	0	0	0	335	43.12	11.62	91	25.78	3.155	17	11.04	0.589	2	1.369	0.069
Kg (Kofar gida)	0	0	0	20	2.574	0.693	25	7.082	0.867	9	5 844	0.312	10	6.849	0.347
Tg (Courtyard)	11	0.756	0.381	27	3.475	0.936	78	22.09	2.705	80	51.95	2.774	115	78.77	3.988
Rf (Rumfa)	9	0.619	0.312	210	27.03	7.282	95	26.91	3.294	24	15.58	0.832	10	6.849	0.347
Dk ('Daki)	872	59.997	30.236	38	4.891	1.318	3	0.850	0.104	0	0	0	0	0	0
Os (Exterior)	123	8 459	4 264	28	3.604	0 971	7	1 983	0.243	0	0	0	2	1.369	0 069
Bd (Toilet)	289	19 876	10 021	6	0.772	0.208	0	0	0	0	0	0	0	0	0
Kc (Cooking Place)	110	7.565	3.814	7	0.901	0.243	2	0.567	0.069	0	0	0	0	0	0
St (Storage)	28	1 926	0.971	0	0	0	0	0	0	0	0	0	0	0	0
Bn (Stairway)	0	0	0	61	7 851	2 115	18	5.099	0.624	2	1.299	0 069	0	0	0
Ts (Transition Space)	0	0	0	25	3.218	0.867	28	7.932	0.971	19	12.34	0.659	5	3 425	0 173
Others	12	0 825	0.417	20	2.574	0 693	6	1 699	0.208	3	1.948	0 104	2	1 369	0 069
Total	1454	100 %	50 42 %	777	100%	26.94%	353	100%	12.24%	154	100%	5.34%	146	100%	5.06%

by the regression coefficient of the connectivity of a space against its RRA ($R^2 = 0.412$).[168]

The last, and perhaps the most important syntactic measure to be considered is the magnitude and variation of the measure of Real Relative Asymmetry (RRA) also termed integration. In simple terms integration is the measure of the accessibility of a space in a spatial system, while its converse segregation, measures the degree of inaccessibility. A high mean integration value in a system indicates that many spaces are isolated, or in syntactic terms, segregated within the spatial network. Access to such spaces is controlled by other spaces which may, or may not, also be segregated within the system. Conversely, a low mean integration value in a system indicates that some spaces are not only easy to access but also strongly control the access to other spaces within the spatial system.

TABLE 8.6: SUMMARY OF HOUSE INTEGRATION VALUES BY SECTOR

Parameters	Mean Integration Values				
	All Houses (N=160)	North Sector (N=35)	East Sector (N=55)	South Sector (N=40)	West Sector (N=30)
Minimum	0.914	0.957	1.002	0.914	0.973
Maximum	2.057	2.057	1.964	2.049	1.653
Mean	**1.397**	**1.425**	**1.404**	**1.429**	**1.310**
Std. Dev.	0.219	0.221	0.212	0.248	0.173
Coeff. Var.	15.708	15.49	15.132	17.36	13.21
Kurtosis	0.379	0.743	-0.241	0.105	-0.526
Skewness	0.552	0.643	0.369	0.574	-0.016

Looking at the pattern of integration of the houses in the sample, it is seen that integration values range from a minimum value of 0.9141, to a maximum of 2.057. Overall, the mean integration for all spaces in the sample is 1.397. Integration values exhibit low variation across the sample as evidenced by the measures of Standard Deviation and Co-efficient of Variance. This pattern seems to be repeated but with little variation when the houses are considered by sector (**Table 8.6**). Thus it is noted that the West sector integration mean is only slightly lower that the sample mean whilst the means for the other sectors are only slightly higher.

However when the houses are considered by family size (**Table 8.7**), it is only the integration patterns for the single and the two family categories that are similar to that of the sample. The other family categories have appreciably lower means. In addition integration values show considerably higher variation in the 3- family category and much lower in the 5-8 family category compared to the sample.

168 The resultant graph is as shown below:

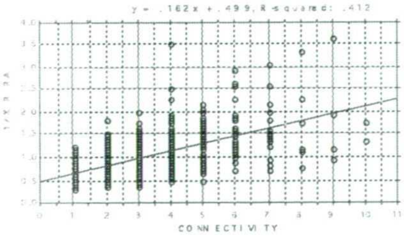

TABLE 8.7: SUMMARY OF HOUSE INTEGRATION VALUES BY FAMILY SIZE

Description	Mean Integration Values					
	All Houses (N=160)	1- Family (N=103)	2-Family (N=31)	3-Family (N=8)	4-Family (N=9)	≥5-Family (N=9)
Minimum	0.914	0.973	0.957	0.914	1.173	1.059
Maximum	2.057	1.904	2.057	1.954	1.398	1.708
Mean	**1.397**	**1.420**	**1.406**	**1.267**	**1.307**	**1.307**
Std. Dev.	0.219	0.200	0.265	0.336	0.066	0.197
Coeff. Var.	15.708	14.06	18.87	26.55	5.050	15.083
Skewness	0.379	-0.380	0.718	0.160	0.015	-0.076
Kurtosis	0.552	0.205	1.005	1.024	-0.663	0.743

From the foregoing one could deduce three major things. First, the values of integration in the sample compare well with those recorded for other domestic systems [169]. Secondly this result indicates, that in Kano those domestic spaces that are comparatively segregated tend to be dominant over those spaces that comparatively, are syntactically shallow. Finally , the strong similarity between the pattern of mean integration values in the sample and the houses grouped by sector tentatively indicates that in terms of syntactic type the sectors are but each a smaller version of the city.

Closely related to this is the question of the relationship between depth and integration in each house, that is the position of the integrating spaces within the system, or what is termed the *integration core* (INTCO). This is considered to be one of the most important 'deep structures' - as opposed to 'surface structures ' [170] of any spatial system because it represents the focus of possible and probable interaction within the spatial system. The INTCO of a spatial system is plotted by marking all the spaces in the system in varying shades of grey from the most integrated to the most segregated space. An arbitrary percentage of the sum of the RRA values of all the spaces in the system, considered representative of the functional characteristics of the system is taken as a base measure. Thus for instance 10 -15 % of the most integrated urban spaces are taken to constitute the INTCO of an urban system and marked with black (Hanson 1989).

The INTCO of the houses in the sample were plotted by taking the justified graph of each house and shading the 33% most integrated spaces black , the 33% most segregated spaces white and hatching the rest. The result is presented in **Appendix 19**. While in most of the cases it is possible to determine fairly accurately which spaces are to be shaded, it became necessary to sometimes extend the 33% rule. This happens where several spaces have co-equal RRA values, and applying the rule strictly would result in either shading too many or too few spaces. Thus the justified graphs are shaded to the nearest 33% RRA values taking into account spaces with co-

[169] Hillier et. al (1987: 373) recorded a minimum mean RRA of 0.460, a maximum mean of 1.730 and an absolute mean of 1.080 for the 15 southern France houses. Hanson (1994) recorded a minimum mean RRA of 1.393 and a maximum mean of 1.968 for the 4 *avant-garde* houses she studied. Trigueiro (1995) recorded a minimum mean RRA of 0.987, a maximum mean of 2.594 and an absolute mean of 1.508 for the colonial English houses in Brazil which she studied.

[170] Note the distinction between 'surface structure' and 'shallow structure'.

equal RRA values. In the case of **House 136** however [171], it was well nigh impossible to determine the spaces to shade without splitting those with co-equal RRA values.

TABLE 8.8: INTCO DISTRIBUTION BY ASYMMETRY AND FAMILY SIZE

Type	DISTRIBUTION OF INTEGRATION CORES										%
	1-Family (N=85)		2-Family (N=31)		3-Family (N=8)		4-Family (N=9)		≥5-Family (N=9)		
	Tree	Ringy	Tree	Ringy	Tree	Ringy	Tree	Ringy	Tree	Ringy	
Shallow	15	11	8	1	3	1	3	-	3	3	**30.0**
Middling	20	4	6	1	1	-	3	-	-	-	**21.9**
Deep	50	3	14	1	2	1	2	1	2	1	**48.1**

As a general rule an INTCO is designated shallow, middling or deep depending on whether it falls respectively below , straddles or falls above the mid-level depth of its system from the exterior . An examination of the INTCOs across the sample (**Appendix 19**), shows that the nature of the cores vary, with some middling others shallow but the majority of the houses have deep INTCOs, that is, the INTCO is focused beyond the mid-level depth of the system. Translated into real terms, this means that the possible, and the highly probable field of encounter, is likely to be in those spaces that are well away from the exterior space. **Table 8.8** shows the INTCO distribution of houses in the sample. It shows that houses with deep INTCOs constitute 48.10% , 30% with shallow INTCOs and the remaining 21.9 % of the sample with middling INTCOs . An interesting observation that seem significant, is the fact that INTCOs tend to be shallow in houses with external rings, most of which are single family houses. These as noted above, have some part of the house serving as a work place, or where the diurnal activities of the *maigida* ,the house-head have a stronger than usual link with the rest of the house. Increase in family size also tends to make for shallow INTCOs. This is especially true for the "Big" houses. Conversely tree like single family houses tend to have deep INTCOs. Thus although the presence of external rings has little or no bearing on the MD of the system, yet it tends to reflect activities that bifurcate the house.

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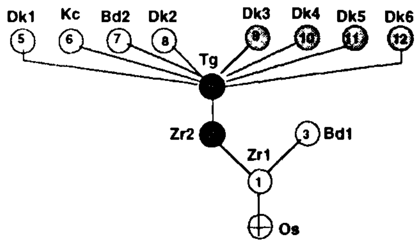
[171] What is presented therefore is an exception to the rule, because in reality spaces 5 -12 have co-equal RRA values. The INTCO of the house looks thus:



136: (UGN-8)

See also **Appendix 19.**

8.3 Spatial Hierarchy Or Order

8.3.1 The *Genotype*

The measure of integration is, in the words of Hanson (1992 : 146-147), "one of the fundamental ways in which houses convey culture through their configuration," for this measure defines , " a relation between the way space is configured and the way space is used in the sense that functional patterning is imprinted into the physical and spatial form of the house. Integration could thus be used to numerically define any discrete functional space. If integration values are in a consistent order across a sample then a cultural pattern or ' genotype ' is said to exist.

In syntactic terms order is," the way in which spaces are categorised according to the ways in which culture arranges activities - what goes on with what, what is separated from what, what must be adjacent and what separated" (Hillier & Penn 1991:30). To identify prevalent patterns in the degree of integration of the various spaces within a complex, spaces are ranged in magnitude from the most integrated space to the least integrated or the most segregated space. However given the multiplicity of the space labels and designations in the Hausa house, it became necessary to categorise functional spaces with cognate characteristics, into discrete units that will facilitate space ordering.

From the nature of the Hausa house (supra **3.3**), the domestic spaces found therein were grouped into five categories as follows (see supra **4.3.3**) ;

A : the entrance hall or *zaure* which includes the *soro* , the *farfajiya* or *dakali*.

B : the *kofar gida* or the outer yard which includes the *turaka* and the outer room or *shago*

C : the *tsakar gida* or central courtyard which includes the service areas like the *murhu* or cooking place

D : the *rumfa* or inner hall

E: the *ɗaki* or room

In addition, because the syntactic values when computed for the houses, show that the order of integration with and without the exterior as the root, is in most cases the same (**Appendices 17 & 18**), the exterior is considered as a functional space and designated Os, even though strictly speaking it is neither a functional space nor is it part of the house. This is the grouping used to order the syntactic values of the functional spaces within each house.

If the houses that form the sample are considered alphabetically, together with their respective orders of integration, but regardless of sector location (**Appendix 12**), four things are *prima* *facie* obvious about their orders of integration. First, these orders exhibit a wide range of variation, however none of these orders has spaces D, E or Os as the most integrated space. Conversely none has space C as the most segregated.

Second, the number of cases where the value of integration of the main functional spaces is co - equal is very small. In other words there is a clear hierarchy in space ordering.

Three, it is seen that of the over 50 or so different configurations, that with numerically the least spaces has four spaces including the exterior. These are the spaces designated A, C, E, and Os. This reinforces what has been noted above about the universality of these spaces in the sample . This is not really surprising since space B is in most cases an extension of space A, while space D is invariably an extension of space E (see supra § **3.3**).

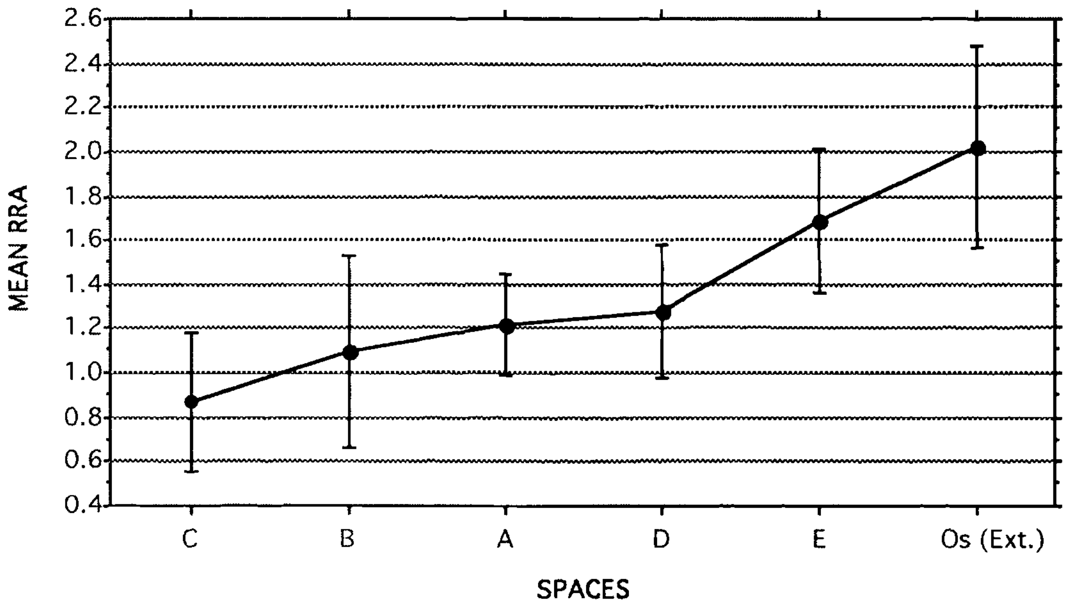


Figure 8.2 : Main Functional Spaces RRA Standard Deviation Bars

Four, and less obvious but perhaps more significant, is the fact that the spatial orders exhibited across the sample could not have been the result of chance; that is the frequency of occurrence of the various configurations is over and above that of the purely probable. For in terms of probability the chance of any of the configurations occurring is between 1 in 24 and 1 in 720, i.e.4.167 % and 0.1389 % respectively [171]. The fact that many of the configurations occur several

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[171] Given that there are six categories of space { A, B, C, D, E, & Os } the number of possible configurations of r number of spaces from a total of N spaces is given by $P\{ N, r \} = \dfrac{N\,!}{(N - r)\,!} = 6\,!\ /\ 0\,!$; where $N = r = 6$.
Which gives a total of 720 configurations, that is discounting the cases of co-equal integration, for example B = C rather than B > C . Therefore the probability of any of the configurations occurring is 1 /720. This is numerically equal to 1.389×10^{-3}, or 0.139 %. Again if only 4 spaces { A, C, E, & Os } out of 6 spaces are considered, the probability becomes 4.167×10^{-2}, or 4.167%.

times over and above the probable, indicates that socio-cultural principles are involved, or the existence of what Hillier and Hanson term *cultural genotype.* We need to identify this genotype (or types) before it is further explored. To establish the nature of this genotype, a Standard Deviation chart for the mean integration values of the main functional spaces is plotted (**Figure 8.2**) . What this chart shows is basically how the occupiers or users of a given space relate to the users and occupiers of another space in the same spatial system. It therefore gives a graphic idea of how the main functional spaces are organised to facilitate or hinder social interaction.

One could thus see that when all the 5 space types and the exterior are considered the basic *inequality genotype* for the entire sample is the configuration with the order C > B > A > D > E > Os . It is also to be noted that most of the functional spaces have quite a wide range of integration values, most especially spaces B and Os, that is the exterior. This notwithstanding, overall the genotype is highly consistent.

However this is the theoretical configuration or *inequality genotype* , but in actual fact only 2 houses , namely **House 71** and **House 124** exhibit this basic configuration, that is 1.25% of the houses in the sample[172]. Further examination of **Appendix 12** reveals four main *inequality genotypes* prevail; these are **C > D > A > E > Os** , **C > A > D > E > Os** , **C > A > E > Os** and finally **C > A > D > Os > E**. These configurations together with their variants [173] constitute 28.13%, 20 %, 8.13% and 6.25 % of the sample respectively. This means that in more than 60 % of the sample the *tsakar gida* or court is the most integrated space while the segregated space is the exterior. Within the house however, the *ɗaki* or room is the most segregated space. But as observed (supra **Figure 3.9**), the *tsakar gida* is also the geographical centre of the house while the *ɗaki* is invariably located at the house's geographical periphery.

8.3.2 Spatial Characteristics And Genotype

To explore further the nature of these *inequality genotypes,* houses in the sample are examined by inhabitants' ethnic origin, inhabitants main trade or profession, income group, family size, spatial asymmetry, sector and by ward . The Standard Deviation charts for each of these categories is plotted, and deductions made therefrom.

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[172] The closest to the theoretical order **C> B > A > D > E > Os** are, **House 8** with **C=B > A=D >E >Os** and the 8 houses (**Houses 29,32,42,47,53,67,77 & 143**) with **C> B > D > A > E > Os** .

[173] See **Table 8.??** for a breakdown of the configurations by type. The first has 5 variants viz.; C=D>A>E>Os , C>B=D>A>E>Os , C>B>D>A>E>Os, C>D=A>E>Os and C>D>B>A>E>Os; the second also has 5 variants viz; C=A>D>E>Os , C>A>B>D>E>Os, C>A>D>B>E>Os, C>A>D>E>B>Os and C>B>A>D>E>Os; the third has a single variant, i.e. C>A=E>Os; The last has 2 variants viz.; C>A>D>Os=E and C>A>Os>E>D.

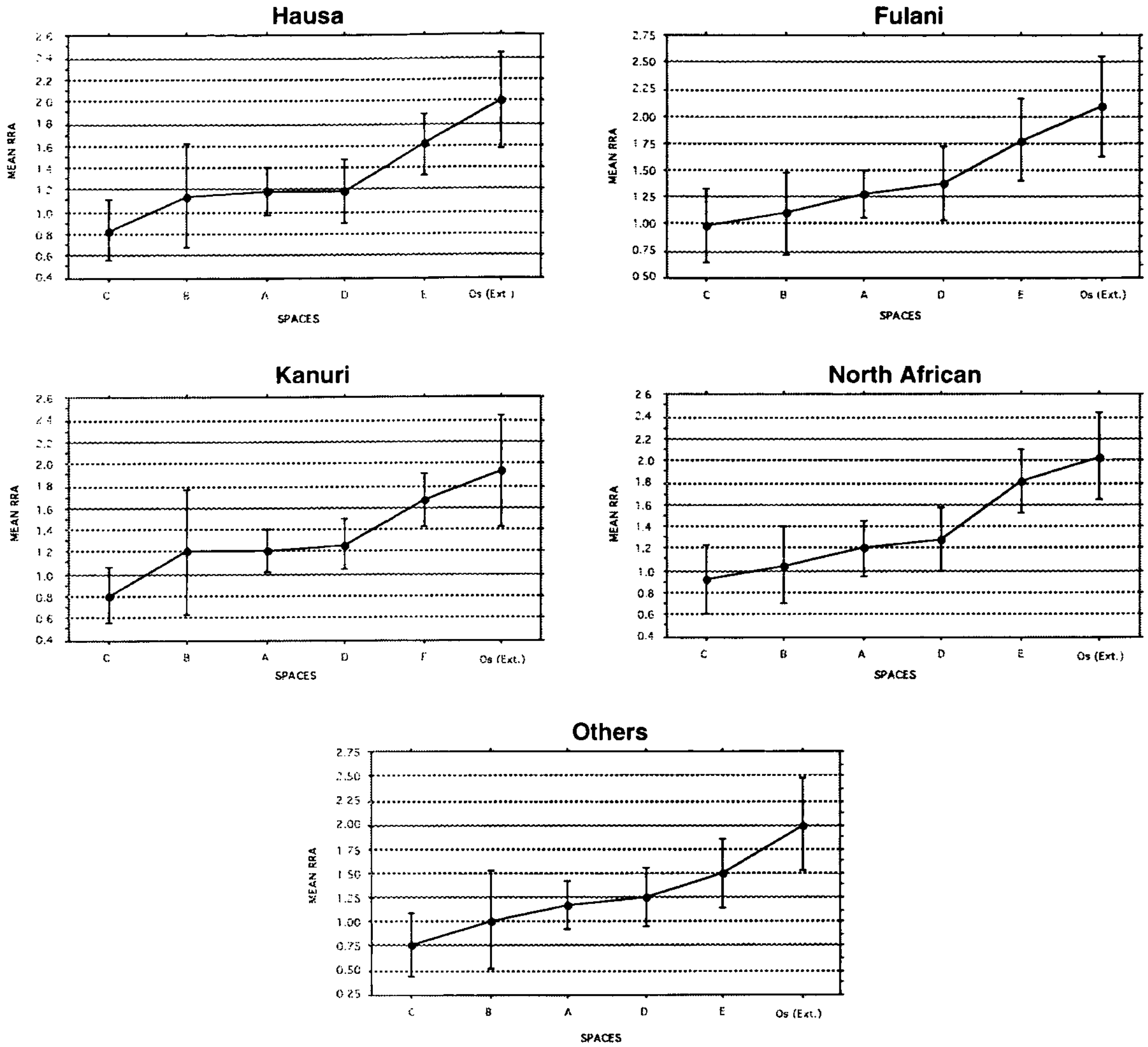

Figure 8.3 : Ethnic Origin Standard Deviation Charts

Plotting the Standard Deviation charts of the houses based on their inhabitants ethnic origin and main trade shows them to be very much similar to the Standard Deviation chart for the whole sample, that is there is not much difference between the configurational pattern of the houses in general and the houses as distinguished by ethnic origin and or trade of the inhabitants (**Figures 8.3 & 8.4**). We can deduce from this that the socio-cultural parameters underlying the spatial organisation of the houses have very little to do with ethnicity or profession. This fact has a far reaching implication for one of the indices of social homogeneity is the merging of ethnicity and socio-economic origin. It remains to be seen if other factors will uphold or dispel this.

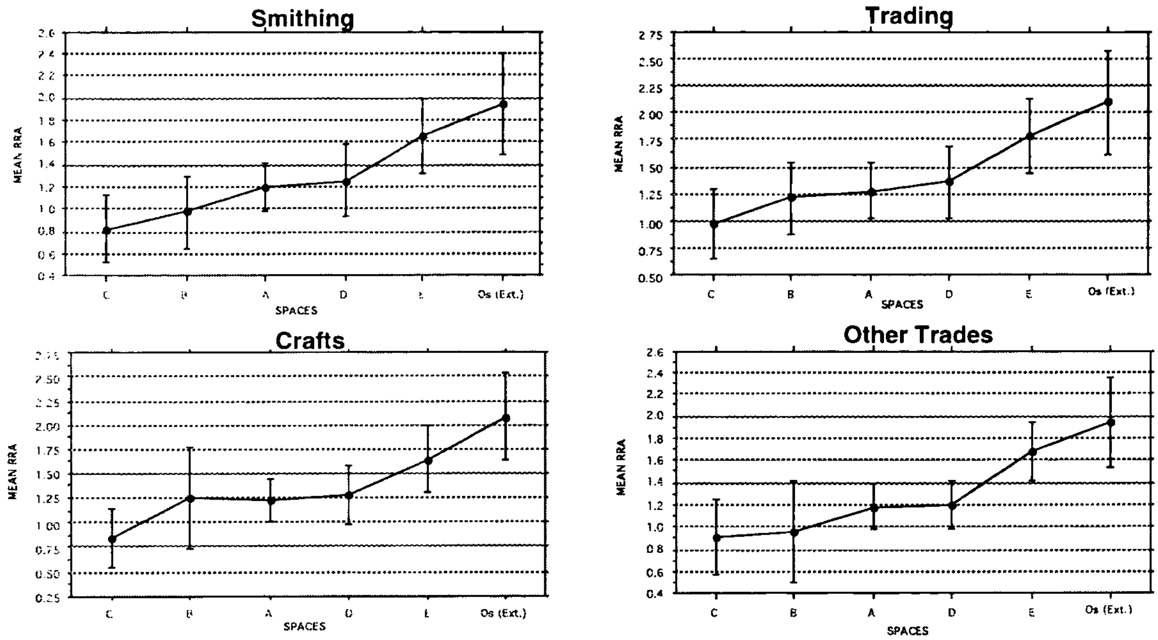

Figure 8.4 : Occupation Standard Deviation Charts

Next we consider the socio-economic disposition of the inhabitants of the house. Like the case of the ethnic and trade affiliation above, the basic inequality genotype holds true for the low and mid income groups, but not for the high income group (**Figure 8.5**). The inequality genotype for the high income group turns out to be **C > D > B > A > E > Os.**

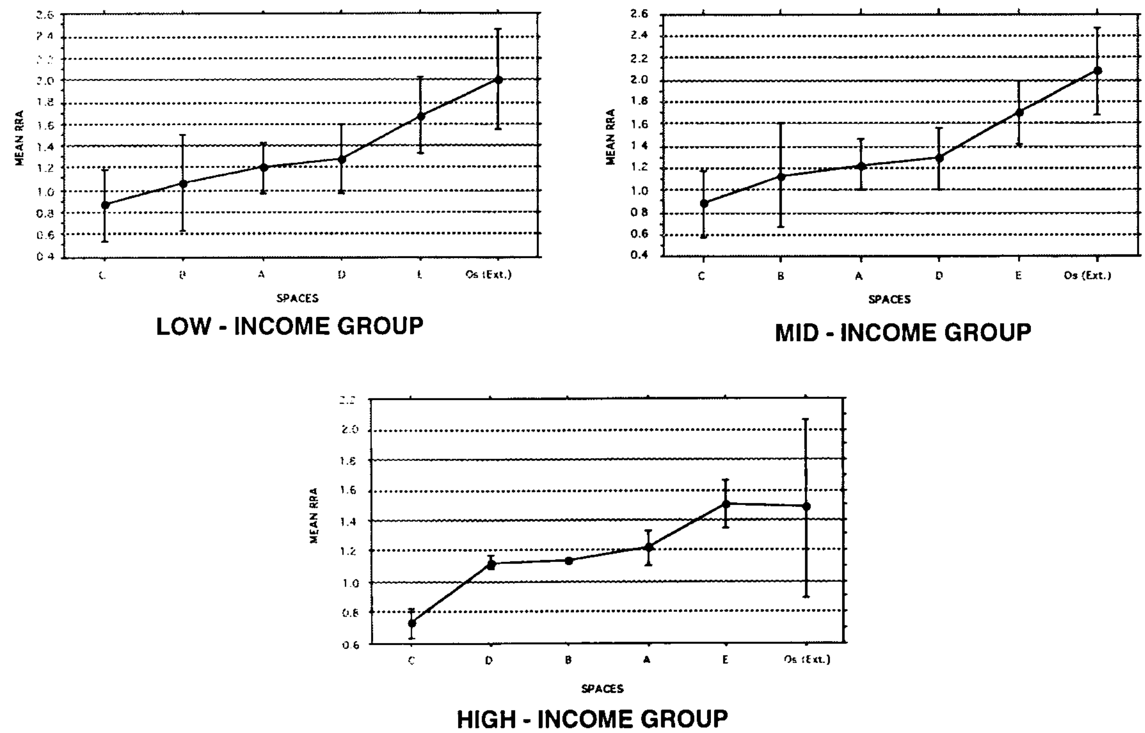

Figure 8.5 : Standard Deviation Charts For Income Group

More significantly, these houses are genotypically far less stable than the houses in the other income groups, especially the low income group. Of course the number of houses belonging to the high income group is small[176], but one can immediately see that some labels are scarcely represented, in particular B space which occurs only once. In addition these houses exhibit a huge variability in relation to the exterior.

Considering the houses by family size shows an interesting manifestation (**Table 8.9**) . The 4 *inequality genotypes* prevalent in the entire sample persist in the 1 to 3 family categories although with individual differences . Thus in the case of the 1-3 family categories B space is either non-existent or where it exists it is invariably less integrating than C space, i.e. C > B. Even then the frequency of this occurring is extremely low, rarely exceeding 5 % of the respective count . In contrast the 4 and ≥5-family categories have significantly higher frequencies of B space . More importantly it is almost invariably more integrating than C space, i.e. B > C.

TABLE 8.9 : DOMINANT CONFIGURATIONS BY FAMILY CATEGORY

Inequality Genotype	1-Family (N=103)	2-Family (N=31)	3-Family (N=8)	4-Family (N=9)	≥5-Family (N=9)
CADEOs	13.59 %	25.81 %	25.00 %	-	-
CDAEOs	30.10 %	19.36 %	25.00 %	-	-
CAEOs	6.800 %	9.680 %	25.00 %	-	-
CADOsE	4.850 %	6.450 %	12.50 %	-	-
BCADEOs	-	-	-	22.22 %	11.11 %
BCDAEOs	-	-	-	11.11 %	-
BCAEOs	-	-	-	11.11 %	-
BCADOsE	-	-	-	-	11.11 %
BOsACDE	-	-	-	-	11.11 %
OTHERS	44.66%	38.70 %	12.50 %	55.56 %	66.67 %

What could one deduce from these observations? The most obvious is that as the number of families increase the configuration of the house shifts from syntactically C-space centred to syntactically B-space centred, that is from the courtyard to the *ƙofar gida* as the integrating space. What is interesting is that both B and C spaces are open spaces. Similarly there is a tendency for the A space and the exterior (Os) to be more integrated.

One could also infer a much greater level of genotypical instability for the larger houses, that is the probability of actualising the basic *inequality genotype* decreases with family size. The fact that the exterior becomes more integrated shows an increase in the degree of the inhabitants' traffic , and to some extent even the non-inhabitants' traffic.

Examining the sample in terms of asymmetry it becomes clear that in the case of both the tree-like and the ringy houses the basic *inequality genotype, i.e.* **C > B > A > D > E > Os**

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[176] Categorising the houses by income group we get 109, 46 and only 5 houses belonging to low, mid and high income respectively.

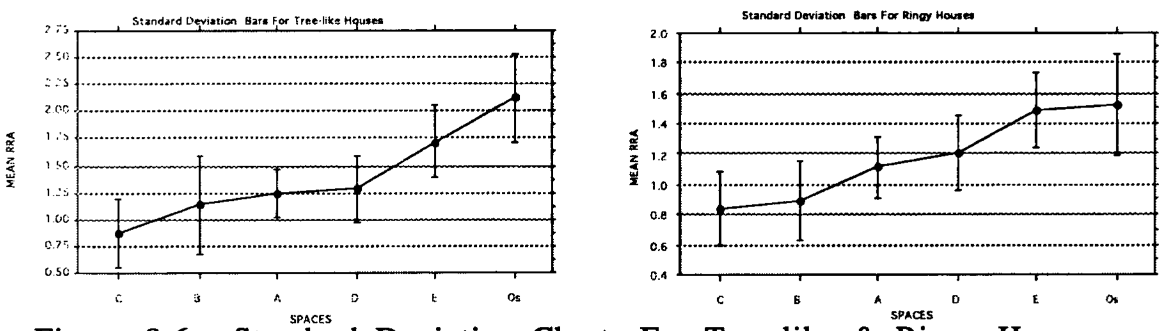


Figure 8.6 : Standard Deviation Charts For Tree-like & Ringy Houses

persists, albeit with one main difference (**Figure 8.6**). Standard Deviations for the Tree-like houses are considerably higher than the ringy houses, and this is especially marked in the case of B spaces. Not unexpectedly, the Standard Deviation plot for the tree-like closely reflects that of the entire sample.

The actual *inequality genotypes* that dominate in the Tree-like houses are **C > D > A > E > Os** , **C > A > D > E > Os** and **C > A > E > Os**. These together with their variants, respectively constitute 28.78 % 23.47 % and 8.33 % of the 132 houses forming this sub-sample.

On the other hand the *inequality genotypes* that dominate the ringy type houses are **C > A > D > Os > E** and **C > A > D > E > Os**, which together with their variants account for 17.82 % and 10.68 % respectively. As a summary it should be noted that Of the 4 main *inequality genotypes*, the **C > A > D > Os > E** configuration seems to be more prevalent in

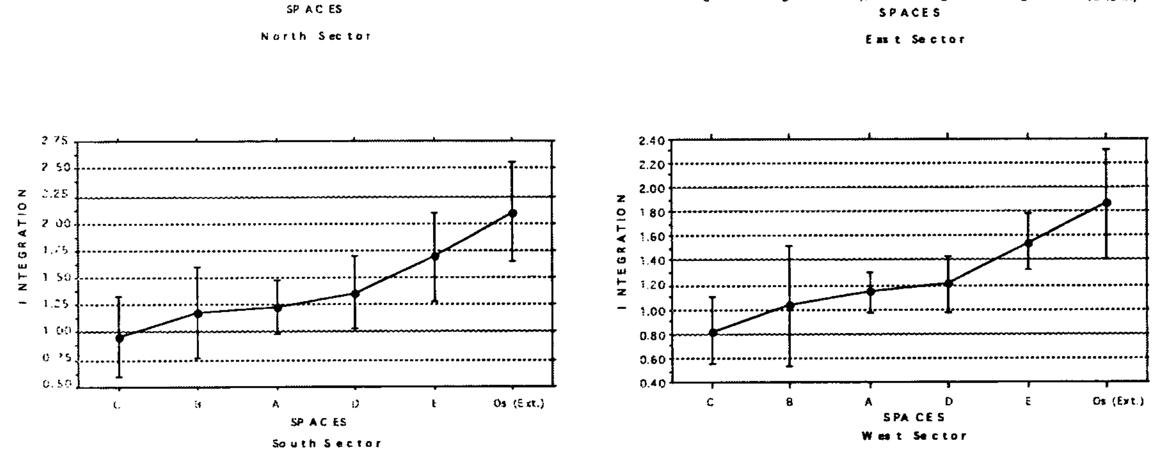


Figure 8.7 : Standard Deviation Bars For The Four Sectors

ringy houses, while the tree-like houses seem to favour **C > D > A > E > Os** and **C > A > E > Os** . On the other hand the **C > A > D > E > Os** configuration features prominently in both tree-like and ringy houses. Thus one could conclude that the presence of rings has very little effect on the genotype.

Next we look at the houses geographically, starting with the sectors before moving onto individual wards. Again as is the case with the single family or the tree-like categories the basic genotype persists, but again with individual differences. First, the North sector (**Figure 8.7**) where it is seen that some spaces are much less differentiated, compared to the sample as a whole.

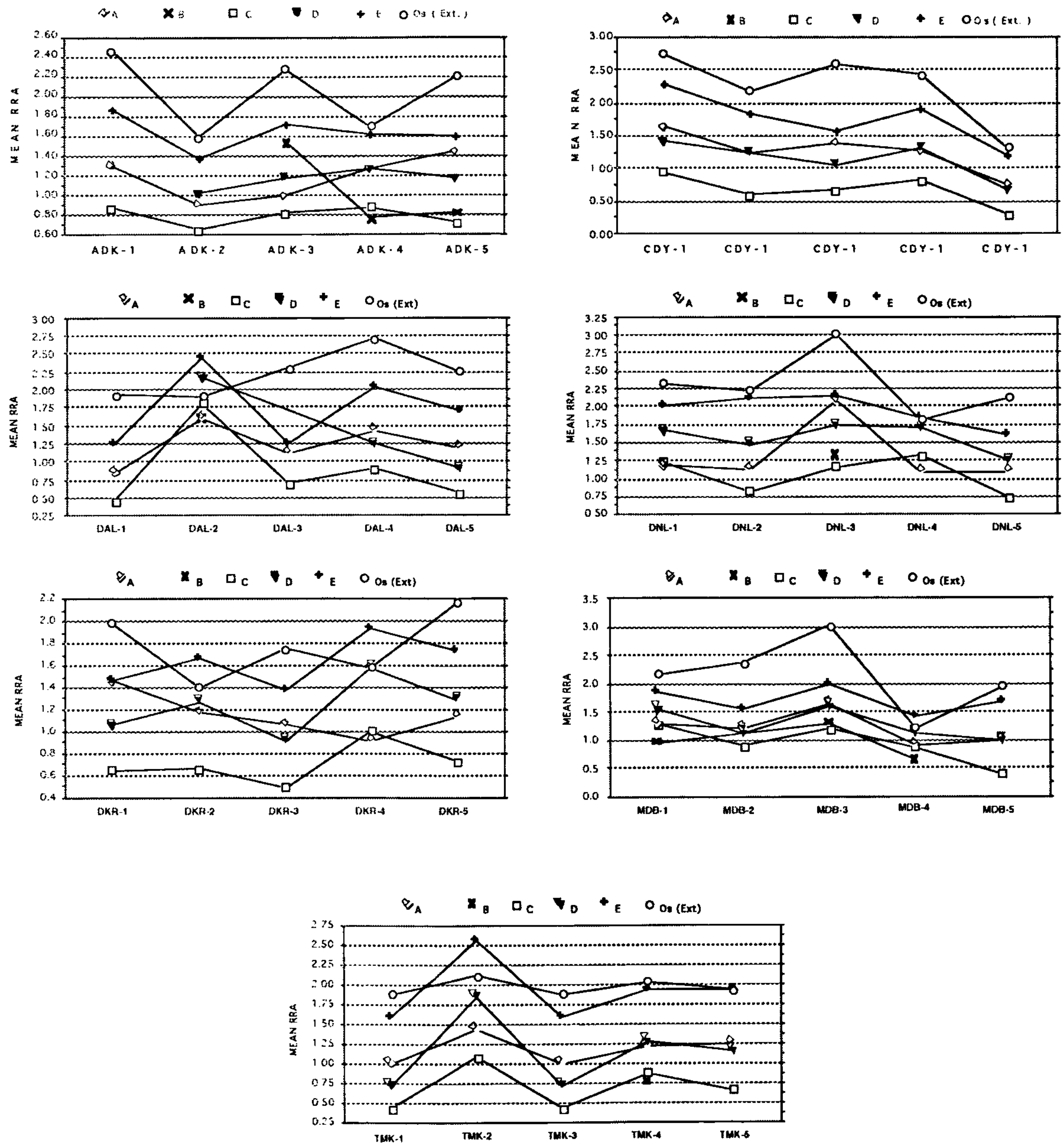


Figure 8.8 : Arewa (North) Wards Mean RRA Line Chart

In particular D space, but to some extent B space also, are comparatively less differentiated. Houses with configurations **C > D > A > E > Os** and **C > A > D > E > Os** constitute 42.46 % 17.14% respectively, of the 35 houses in the sector. The other two dominant configurations, namely **C > A > E > Os** and **C > A > D > Os > E**, feature less prominently with only 8.57 % and 5.71 % respectively . What are the genotypical characteristics at the ward level ? Before proceeding it is worthwhile to recall that the number of houses taken as sample from each ward is in most cases 5 houses. In only 4 cases is this number exceeded. Thus to all intents and purposes the spatial analysis of the wards is also the spatial analysis of the individual houses.

Of the 7 wards from the sector, the configurations of 5 conform, *mutatis-mutandis* to the basic *inequality genotype* (**Figure 8.8**). Two wards, **Cediya** (CDY) and **Dukurawa** (DKR) stand out in that there is no B space in any of the houses in these wards . What is even more notable about CDY is that its A and D spaces appear to be close and almost interchangeable .

Also the mean of its D spaces is lower than the mean of its A spaces , which in effect makes the ward wholly a **C > D > A > E > Os** ward. One could therefore safely conclude that overall the North sector conforms to the basic genotype although there are individual houses that deviate due to the instability of B and D spaces .

Secondly, we consider the East sector, from where the largest sample of houses is drawn. Its Standard Deviation chart shows it to be in almost total congruence with that of the entire sample (compare **Figures 8.2** and **8.7**). It is therefore not surprising to observe that the ratio of *inequality genotype* exhibited by this sector is virtually the same as that of the sample [177]. The 4 dominant *inequality genotypes* namely, **C > D > A > E > Os** , **C > A > D > E > Os** , **C > A > E > Os** and **C > A > D > Os > E** together with their variants, respectively constitute 23.64 %, 16.36%, 9.09% and 5.45 % of the 55 houses in the sector.

However if the wards are examined in detail, significant differences mainly associated with B or D spaces or both, become obvious. In some wards (GBR, MGN), B spaces are totally absent in all the houses , while in some (DAR, SRF, ZBR) , they occur only once. The effect of this as we noted in the case of the preceding sector, is to make the basic *inequality genotype* unrealisable. Where B space exists it exhibits either very wide or very little variation further confirming its intrinsic instability. **Bakin Zuwo** (BZW) and **Tudun Nufawa** (TNF) wards are good examples of the former, whereas **Danbazau** (DBZ) , **Darma** (DRM) ,and **Kwarin Mabuga** (KMG) wards are good instances of the latter.

Several houses in this sector seem to be oddities vis-a-vis the basic inequality genotype. **Table 8.10** presents the characteristics of these " non-conformist houses " graphically. What is

[177] It is possible that this congruence is in some way due to the large number of houses from this sector in the sample. However it cannot be the only reason since houses from this sector constitute only about 1/3 of the houses in the sample.

interesting is that each house is either a multi-family house or a house with non-trivial ring. It is obvious from the table that **House 21** and **House 70** are exceptions. However these two houses have one thing in common, and that is they are 'fragmented' houses, i.e. they used to be part of what were once "Big houses".

Further it is possible to broadly group the odd houses into two; those where the C space, i.e. the courtyard is syntactically deep, and those where the Os space, i.e. the exterior is syntactically shallow. Looked at this way it is easy to note that the single family houses with syntactically deep courtyards all belong to successful merchants, as is the case with **Houses 94, 98, 101 & 102**[178]. And although one family is recorded for each, these are all polygamous houses with at least 2 wives cohabiting, each with a separate section or apartment but sharing certain basic facilities. Thus they share many social characteristics with the "Big houses".

TABLE 8.10 EAST SECTOR NON-GENOTYPICAL HOUSES

Syntactically Deep Courtyard				Syntactically Shallow Exterior			
House Identification	Order	Fam. Size	Assy	House Identification	Order	Fam. Size	Assy
House 122 (SRF -3)	ACOsDE	2	Tree	House 70 (TNF-3)	ABCDOsE	1	Tree
House 94 (TNF-5)	BACOsDE	1	Ring	House 128 (ZBR-4)	BACDOs	2	Tree
House 159 (KMG-2)	BACOsDE	8	Ring	House 121 (SRF -2)	BACEOs	2	Tree
House 153 (DBZ -2)	BAOsCDE	5	Tree	House 152 (KMG-1)	BCADEOs	5	Tree
House 101 (KOK -1)	CAOsDE	1	Ring	House 21 (DRM -2)	BDACEOs	1	Tree
House 102 (KOK -2)	CAOsDE	1	Ring	House 87 (DAR -4)	BDACEOs	1	Ring
House 98 (GBR -1)	COsDAE	1	Ring				

Another thing worth noting is that the 2-family houses with syntactically shallow exterior are houses with two separate sections, which for lack of better terminology, one might call "composite" houses while the single family houses are mostly " fragmented " houses. Of course House 152 is a "Big" house .

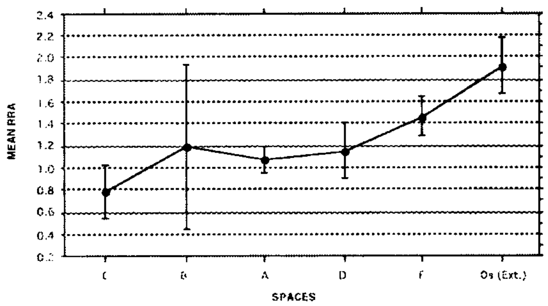
Thirdly, we move to the South sector. The Standard Deviation chart for the sector conforms to that of the sample, although it is clearly different from it (See **Figure 8.7** above). The distribution of the 4 dominant *inequality genotypes* follows the same pattern as those of the preceding sectors. Thus we have 22.50%, 20%, 10% and 5.45 % of the 40 houses having the order **C > A > D > E > Os, C > D > A > E > Os, C > A > E > Os** and **C > A > D > Os > E** respectively. In this sector too B space is erratic; in one ward Unguwar Gini (UGN), it is completely absent

[178] Except for **House 94** which was constructed with adobe, all the others were constructed with concrete blocks and roofed with corrugated iron sheets.

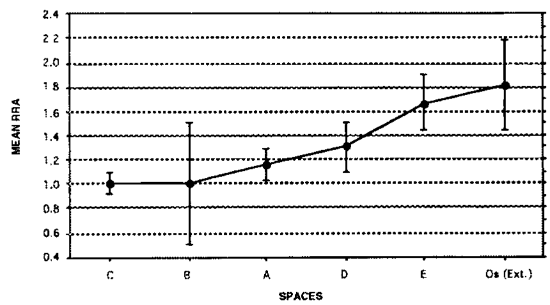
whereas in the case of two wards , **Alfindiki** (ALF) and **Sheshe** (SHS), it occurs only once. Both houses have all the characteristics of a " Big " house and it is therefore not surprising to find in each case B space as the integrating space.

Finally if we look at the West sector in isolation, we can deduce that in many respects what obtains here is, broadly speaking a repetition of what was observed in the case of the other sectors. Again the 4 dominant *inequality genotypes* prevail, with **C > D > A > E > Os** 30%, **C > A > D > E > Os** 26.67 % , **C > A > E > Os** 5.71% and **C > A > D > Os > E** 3.33% of the 30 houses from the sector. The Standard Deviation charts for the sector more or less conform to the basic inequality genotype. However it is noticed that the variation of the B space is considerably higher than normal (**Figures 8.2 & 8.7**).

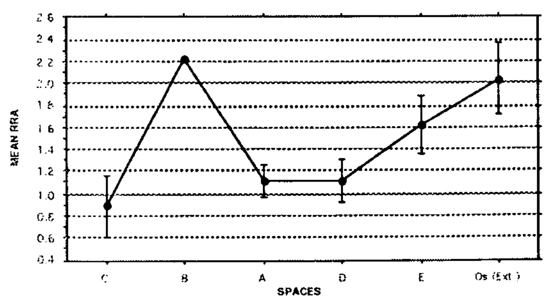
Looking at the wards individually, the Standard Deviation charts for 3 wards, namely **Baƙin Ruwa** (BRW), **Jingau** (JNG) and **Lokon Maƙera** (LMK) stand out (**Figure 8.9**). These last two wards have a much wider variation in B space values than normal, which as we have noted, shows up in the Standard Deviation chart for the sector. In each of these wards we have two houses where in one the B space is well integrated, and in the other it is highly segregated[179].



Lokon Maƙera Ward



Jingau Ward



Baƙin Ruwa Ward

Figure 8.9 : Standard Deviation Charts For 3 West Sector Wards

[179] In JNG it is **House 154** and **House 93** respectively, while in LMK we have **House 132** and **House 79** respectively.

It is not surprising to find that the houses with well integrated B spaces are either "Big" or "composite" houses. As we have noted above, it is characteristic of "Big" houses and also to a lesser extent "composite " houses, to have B spaces well integrated .

Turning to the two houses with highly segregated B spaces , we note that the B space in **House 79** connects directly to the exterior of the house without any intervening space. In **House 93** its B space connects directly to a second *zaure* (entrance hall) as well as being on a ring which links the exterior, the *shago* (outer room)and the first *zaure* (entrance hall). We can therefore see that the B spaces in these two houses are placed in positions normally taken by A spaces, hence they exhibit syntactic properties of A spaces.

In the case of BRW it is **House 55** , the only house with a B space, that is responsible for the observed anomaly because it is highly segregated. A closer look at the layout of the house shows a similar situation to that of **House 79** , that is its B space connects directly to the exterior of the house, once more acting like an A space.

From the foregoing we could conclude three things ; One , the strong basic *inequality genotype* and the persistence of the 4 dominant *inequality genotypes* irrespective of geographical location within the city indicates a high level of socio-cultural homogeneity ; Two , the fact that the Standard deviation chart for the East sector is almost identical to that of the sample as a whole may be an indication of the stronger attachment to cultural norms in the sector and , or a higher level of social homogeneity. This is not surprising given that this is the most populous and the most compact of all the sectors. Thus, as noted above (supra **§ 6.2**) the South sector may be the trend setter when it comes to architectural innovations, but the East sector is the bastion of cultural norms when it comes to spatial values and preferences; As the Hausaman is wont to say, " Over the king of power , the king of popularity prevails" [178]. Three, the basic *inequality genotype* holds true for the 1-2 family non-fragmented, non-ringy houses, but to a large extent not for multi - family and or ringy houses. In contra-distinction to the basic *inequality genotype*, the multi - family and or ringy houses are more likely to have an order of B > C > A >< D > E >< Os, taking the " >< " sign as indicating interchangeability of two spaces.

8.3..3 Genotypical Properties

Having established the basic genotypes what could be said about the genotypical properties of the houses? In the first place the identifying characteristics are the syntactic shallowness of the C spaces, i.e. the courtyard. In other words the courtyard is in most cases globally, the most integrating space and locally the most connected as well as controlling space. Its control lies in it is being the main, and in many cases the only, link between the outer and geographically more accessible parts of the house, and its inner and syntactically deeper parts. This space is a female -

[178] *Sarkin yawa yafi sarkin ƙarfi* .

oriented space. For as noted while discussing quotidian space utilisation (supra **Chapter 7**), it is almost wholly utilised by the females to the near total exclusion of the adult males, who may use it only as a transition space. In terms of physical attributes it commands on average, between one-quarter and one-third of the total floor area of the house.

The second identifying characteristic is the correspondingly invariable syntactic depth of the E spaces, i.e. the *ɗaki*. It is usually the most segregated space and in contra-distinction to the C space, the most controlled rather than controlling space. This as noted (supra **§ 7.3.1**), is a gender restricted or composite space, that is it is utilised by either sex limited only by the time and the particular use. It is the most intimate space, literally and figuratively. This is where respected female guests and intimate male guests are usually received. Significantly, it is also where procreation takes place.

The third identifying characteristic is the moderate syntactic shallowness of the A & B spaces, i.e. the outer parts of the house. These it should be remembered are male dominated spaces. But whereas the former is wholly and fully a male space, the latter is in some cases, appropriated by females; in particular for economic endeavours. What is extremely noteworthy is that in the syntactically larger houses, there is a preponderance for these two spaces to be more integrating, or as integrating as the C space. However B space is not syntactically stable, perhaps because this space is not always available.

There are thus two basic *inequality genotypes* manifesting each with several phenotypes which could be seen as variations on one or the other theme. In the first case the basic *inequality genotype* as we have seen is C > B > A > D > E > Os, typical examples being **Houses 71 & 124**. One of its variants is numerically the largest in the sample, that is the order C> D > A > E > Os, as exemplified by **Houses 56 & 65**; these types of houses could be said to be basically female-space centred. In the second case the basic *inequality genotype* is B > A > C > D > E > Os, typical examples are **Houses 83, 129 & 155.** This has even more variants, than the other *inequality genotype* . Typical examples are the order A > B > C > D > Os > E (**House 70**) and A> Os > C > E (**House 137**). these types of houses could be said to be basically male-space centred. Clearly the first basic *inequality genotype* is the stronger and more extensive, while the second is the weaker more limited of the two.

We have used the terms "female-space" and "male-space centred" and it is very tempting to conclude that the differences observed here are basically those of gender. However this would be too simplistic, and one would be ignoring other social and psychological needs that the domestic environment fulfils. These include the need for privacy, social identity, socio-economic status, and even concepts of morality and cosmology .

But even if this is so, this would lead to a spatio-cultural conundrum; is the house configured to exalt or control one or the other gender ? If one assumes the syntactically smaller house accommodating one or two families as the cultural ideal then the resultant configuration is to exalt gender. If on the contrary one assumes the syntactically larger house accommodating multi - families as the sanctioned, then one would conclude that the spatial configuration is for one gender to control the other. Like everything human and social the reality is but complex. For this one would only be confident that , " the truth is out there."

8.4 Spatial Differentiation / Spatial Structure

As we noted above the mean integration values vary little across the sample as evidenced by the low value of Standard Deviation, which is 0.219. But to what degree are these values of integration consistent both within and across the entire units in the sample ? An appreciation of this consistency is extremely important since consistency in spatial patterning is according to Hillier et. al. (1987:364-365), " one of the most general means by which culture is built into spatial layout." The measure of Base Difference Factor (BDF) is used to detect this consistency . Little variation in the integration values within a spatial system indicates an ' unstructured' spatial system, and this shows as BDF values that tends towards one.

TABLE 8.11: BASE DIFFERENCE FACTOR COMPARISON

CATEGORY	Base Difference Factor						
	Min	Max.	**Mean**	Std Dev.	Coef Var.	Skew	Kurt.
Whole Sample	0.492	0.912	**0.749**	0.077	10.34	-0.594	0.467
North Sector (N=35)	0.571	0.871	**0.745**	0.072	9.841	-0.471	-0.547
East Sector (N=55)	0.492	0.899	**0.747**	0.081	10.745	-0.764	0.906
South Sector (N=40)	0.522	0.912	**0.757**	0.085	11.144	-0.762	0.648
West Sector (N=30)	0.586	0.899	**0.742**	0.070	9.413	-0.022	0.122
1-Family (N=103)	0.492	0.899	**0.745**	0.074	9.960	-0.616	0.911
2-Family (N=31)	0.571	0.899	**0.749**	0.085	11.385	-0.307	-0.711
3-Family (N=8)	0.561	0.912	**0.717**	0.128	17.782	0.057	-1.255
4-Family (N=9)	0.684	0.822	**0.772**	0.044	5.751	-0.729	-0.300
≥5-Family (N=9)	0.720	0.851	**0.788**	0.046	5.820	-0.235	-1.147

Table 8.11 summarises the BDF characteristics of the sample. The mean BDF value of 0.749 and a corresponding Standard Deviation of 0.072 is a quantitative statement to the effect that there is considerable differentiation across the spatial complexes in the sample. Thus houses in the sample are on the whole quite well ' structured '.

The table also shows the pattern of spatial differentiation by sector and by family size. In both cases the pattern elicited is similar because the values of the respective means and Standard Deviations closely approximate that of the sample. Two main observations are apparent from this result; first there is a strong consistency in the mean BDF values irrespective of the geographical location, family type, or the number of cases per category; secondly, one could rule out chance in the possible causes of the result, that is, the result obtained is beyond the purely probable. From this one main conclusion could be drawn which is, what is obtained is indicative of the persistence of the cultural norms underlying the organisation of spaces in the given milieu. That is a genotype or types exist.

It is possible to combine RRA and BDF values to explore further the significance of spatial configurations. This is because these two syntactic measures are taken to express the cultural pattern in *things* ; independent of the way they are interpreted. Thus articulated, they are used to discern culturally significant typological differences between different domestic spatial systems (Hillier et. al. 1987: 364-365).

Spatial systems that are on the whole " unstructured" , are taken to be either "homogenised" or "anomie", depending whether they are on the whole integrated or segregated. Spatial systems that combine low mean RRA and high BDF are understood to have spaces that are mutually accessible and interchangeable and hence the term "homogenised". On the other hand spatial systems that combine high mean RRA and high BDF are understood to have spaces that are atomised, i.e. segregated but not differentiated or related, hence the term "anomie" (**Figure 8.10**).

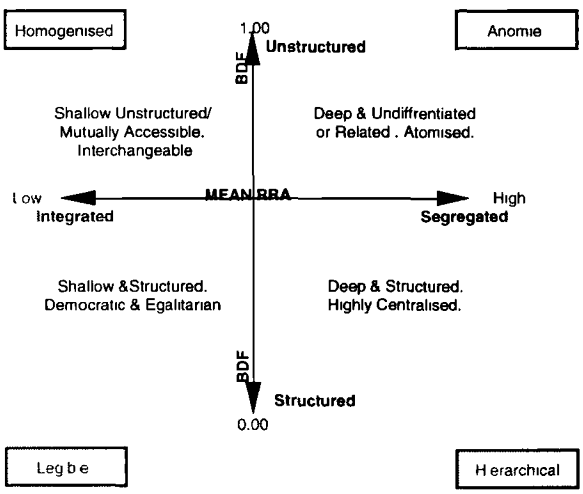


Figure 8.10: Spatial Structure

Conversely, high variation in the integration values indicates a " structured " spatial system and this manifests as BDF values that tend towards zero. Such spatial systems are understood to be either " legible " or " hierarchical" , again depending on their mean RRA. Systems with low mean RRA and low BDF are understood to be democratic and egalitarian because they are both shallow and "structured". They are thus considered to be "legible". In reality though, such systems are understood to be practically improbable. Systems with high mean RRA and low BDF are considered highly centralised systems where spaces are kept well apart. Hence they are understood to be hierarchical, indicating a high probability of privileged access and control of some spaces over the rest of the complex.

To explore how BDF relates to RRA the two values are regressed and the resultant graph is presented in **Figure 8.11**. Several things becomes clear from this. First, the regression value ($R^2 = 0.398$) shows this relationship to be significant, i.e. in a number of cases, mean integration value is a fairly good predictor of the structure of a given complex in the sample. Secondly, taking the mean RRA and BDF lines on the graph as base measures we note that houses in the sample are almost evenly spread between the " structured" and the " unstructured " sections [181].

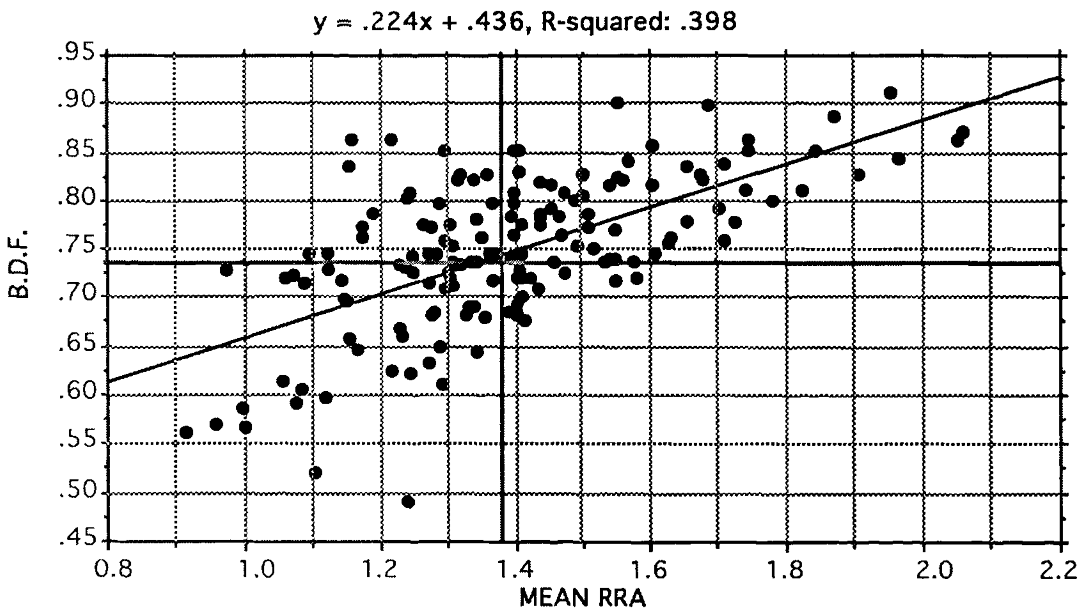


FIGURE 8.11 : Mean RRA Versus BDF

Thirdly, it is interesting to note that most of the " structured " houses (approx. 76%) fall into the " legible " quadrant with only 24 % falling into the "hierarchical" quadrant. Conversely about two-thirds of the " unstructured " houses (68%) fall into the " anomie " quadrant and the rest fall into the " homogenised " quadrant. Thus there is a tendency for the more integrated complexes to be more syntactically structured and the more segregated ones to be syntactically more unstructured.

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[181] In actual fact there are 81 house with BDF greater than the sample mean of 0.749 against 79 with less.

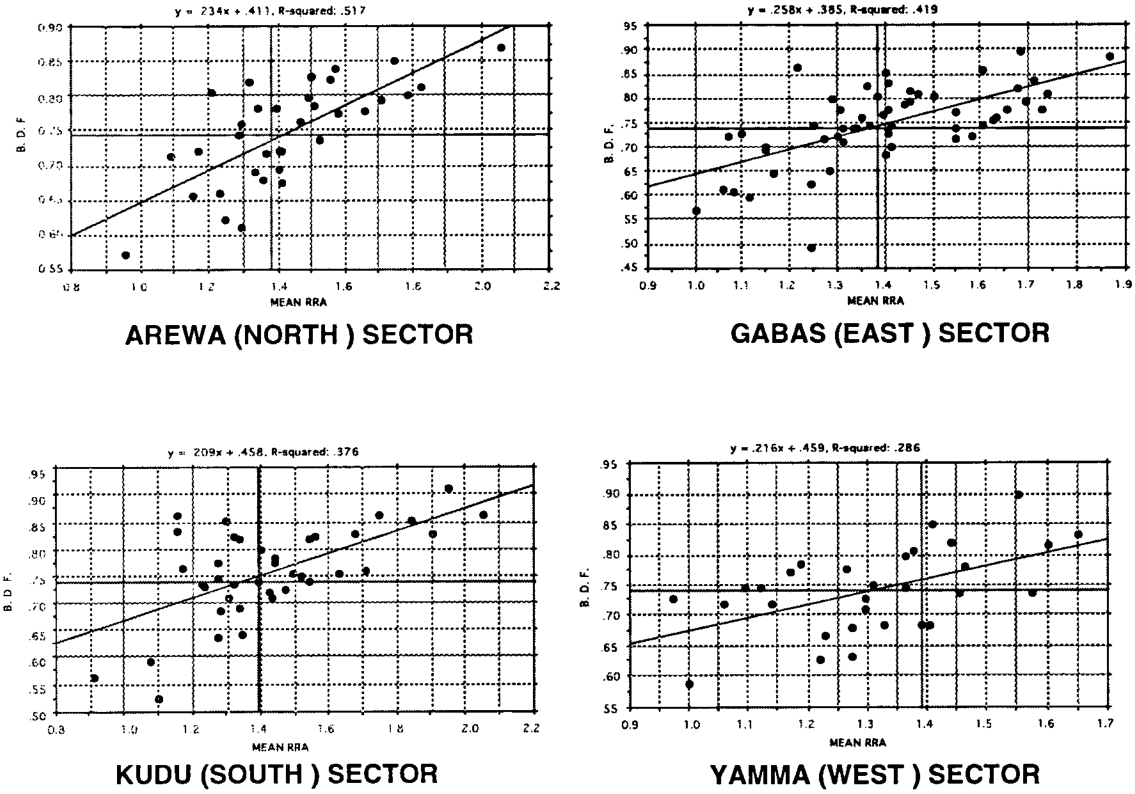

Figure 8.12 : Mean RRA/ BDF Sector Regressions

Considered by sector , the BDF / Mean Integration regressions for the South, East and North sectors have values that reflect that of the entire sample. That is, they exhibit similar tendency for the more integrated complexes to be syntactically structured. However the regression value for the West sector is notably different (**Figure 8.12**). Whereas in the other sectors there are almost as many integrated and structured units as there are segregated and unstructured ones, here there seems to be of the former than the latter. In addition the tendency is for the more integrated complexes to be legible rather than homogenised.

Examining the relationship between Mean RRA and BDF in terms of family size shows a very different picture (**Figure 8.13**). To begin with the 1 and 2 family regression graphs strongly reflect that of the sample as a whole. This is perhaps to be expected since the bulk number of the houses in the sample fall into these two categories. Into this bracket the 3-family category could more or less be included. However the case of the 4 and 5-family houses is entirely different. Most of the houses in these two groups are unstructured but whereas the houses in the 4-family category are well integrated, the 5-family houses are as integrated as they are segregated.

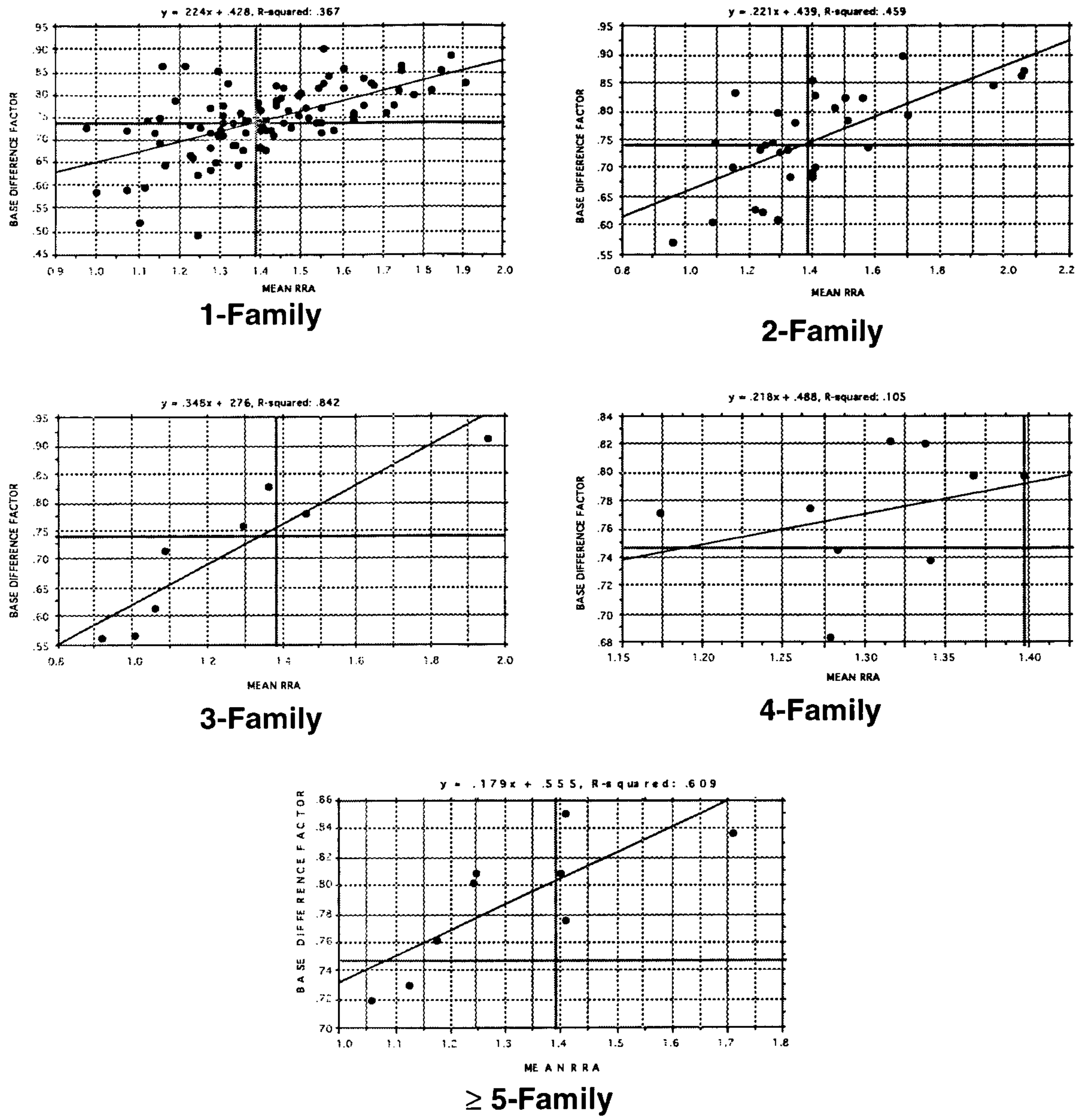

FIGURE 8.13 : Family Size Mean RRA / BDF

What could one glean from all the observation on the houses in the sample ? The high mean integration value by itself means a system where more intercourse is expected and its corollary, less privacy. On the other hand the 'weak' mean differentiation by itself could mean several things; it might mean that spaces are highly differentiated and hence predisposed to control and marked formality (Trigueiro 1995:102); it might mean control by itself, that is what is not in the rule governing its disposition is in the rule governing its use; but it might also mean that neither the space nor the rules prevail in which case the system is " permissive ". There is thus an apparent contradiction in terms in the Kano house. This can be further explored if the concepts of *interface* and *programme* are taken into account.

The concept of *interface* has to do with the," spatial relation between or among two broad categories of persons," (Hillier & Penn 1991:33); the *inhabitants* whose social identity is more firmly built into the spatial system and who exert social control over the spatial system , and the *visitors* whose social identity is less weakly built into the spatial system and who have diminished control over it. That of *programme* has to do with how well spatial relationships are circumscribed; where this relationship is clearly defined the spatial system is said to exhibit a strong programme and where it is diffused, a weak programme is said to exhibited (*ibid.* : 34).

From the point of view of the *visitors* , the Kano house could be said to exhibit a strong *programme.* However the strength of this programme diminishes the closer one's locus is to the INTCO, such that at the integrating space, interfaces, whether *inhabitant-qua-inhabitant* or *inhabitant-qua-visitor* are governed more by social rules rather than by the social programme [182]. Thus the court is syntactically one of, if not the most accessible functional space in the house, and at the same time it is a very private space. Access to it is a social privilege subject to the highest control, but at the same time it is the most informal functional space; that wherein the interplay of people and activities is broadly approved.

To complete this sub-section it is perhaps necessary to examine the degree of differentiation of the RRA values of the 5 main functional spaces. While discussing the quotidian use of space in Chapter 7 it was noted that the dominant spaces are either gender specific or gender restricted (**supra § 7.3.1**). It was then concluded that spaces **A** and **B** are clearly male controlled spaces , spaces **C** and **D** are female controlled spaces while space **E** is broadly speaking bipartite.

TABLE 8. 12 : BDF FOR THREE MAIN FUNCTIONAL SPACES

Descrip	Sample	BDF FOR 3 MAIN FUNCTIONAL SPACES									
		ABC	CDE	ACE	ABD	ABE	ADC	ADE	BCD	BCE	BDE
Count	160	57	139	160	52	57	52	139	52	57	52
Min.	0.492	0.728	0.655	0.602	0.842	0.806	0.811	0.872	0.812	0.684	0.811
Max.	0.912	0.998	0.991	0.997	0.999	0.997	0.997	1.000	0.994	0.991	0.998
Mean	**0.748**	**0.936**	**0.889**	**0.881**	**0.948**	**0.920**	**0.950**	**0.955**	**0.936**	**0.888**	**0.924**
Std De.	0.078	0.054	0.076	0.074	0.036	0.048	0.037	0.028	0.039	0.063	0.048
Co.Var	10.394	5.801	8.534	8.384	3.798	5.195	3.894	2.902	4.216	7.116	5.240
Std.Err					0.005	0.006	0.005	0.002	0.005	0.008	0.007
Mode	0.755	-	-	0.715	-	-	-	0.872	-	-	-

Out of the 5 main functional spaces it is theoretically possible to have 10 discreet sets of 3 spaces each. The degree of differentiation among these is examined. **Table 8.12** presents the parameters of the 10 sets of main functional spaces. From this it is noted that the set ACE has the lowest

[182] The relationship between *programme* and configuration is a two-way relationship, for as put aptly by that guru of *savoire-faire*, Sir Winston Churchill, " we shape our buildings and afterwards our buildings shape us."

mean differentiation value (0.881) and the closest to the sample mean (0.748). Also this set has the largest count , i.e. these spaces are to be found in every house in the sample. Two other sets, CDE and BCE have similarly low mean differentiation values (0.889 and 0.888 respectively). It should be noted that the frequency of occurrence of the CDE is high , while that of the BCE is rather low. However all the other sets have very weak mean differentiation values which in each case exceeds 0.900.

Several things can be deduced from this; first the spaces A, C and E are what may be termed "universal" spaces because they are to be found in every house. Secondly, of all the 5 main functional spaces these are what may be called the "structuring" spaces since they have the strongest mean BDF. From this result one could safely conclude that a genotype or genotypes exist in which these spaces are not only stable but have stabilising effect with respect to other spaces . Thirdly, it is noted that the sets with the strongest mean differentiation (0.881, 0.889 & 0.888 respectively) are ACE, CDE and BCE. The first and the third comprise of one male and one female controlled spaces (A, B and C respectively) and one composite space (E), while the second comprises two female spaces and one composite space. All the other sets that exhibit weak mean differentiations (0.920 to 0.955) comprise 2 male spaces or a male space and a composite space. In only one case (BCD) is there an exception. This set has one male space but no composite space. From this we could see that female spaces tend to be more strongly differentiated than male spaces. We can thus conclude that the strength or weakness of the probable genotypes may be highly dependant on the syntactic presence of the main functional spaces that are female controlled.

8.5 Summary

The central argument of space syntax is that spatial configuration is the principal though admittedly not the sole, means by which social intercourse and processes express themselves in space. In simple terms social laws and regulations are determined by the way in which space is configured. For this reason a full comprehension of the spatial configuration of the inhabited space of a society is a pre-requisite of understanding that society.

The spatial characteristics of the houses in the sample show it to be, on average comprising of 10 - 20 convex functional spaces. The number of houses with less than this average syntactic size are balanced by those that exceed the average. The resulting justified graphs are for the part asymmetrical or tree-like. The few houses that exhibit ringy justified graphs have rings that are mostly external and trivial. Mean depth measurements are consistent throughout the sample. This is irrespective of the asymmetry of the house or its geographical location within the city. However the larger houses seem to have significantly higher the mean depth.

The local disposition of the main functional spaces seems to be restrictive, that is most of the spaces are minimally connected and with weak control values. Only about one-third of all the spaces in the sample have strong control values. There thus seems to be a consistency in the local disposition of the individual spaces as indicated by the close relationship between the measures of connectivity and control.

Of all the syntactic measures, that of RRA or integration, is the most revealing of the social logic of space. The pattern of integration is consistent across the sample if the houses are considered by location but not by family size. Thus the size of the house has a bearing on its mean integration value. Closely related to this is the location of the highest field of probabilistic encounter, the integration-core. About 50% of the houses have INTCOs that are deep, while about 20% have INTCOs that are centred about the mid-depth of the spatial system. This means that in most cases the probable field of encounter is well away from the exterior of the house.

Base Difference Factor measurements indicate that the degree of variation in integration values is consistent across the sample. This, like the case of mean depth is irrespective of the family size of the house or its geographical location within the city, attesting to the presence of a genotype. Further examination shows the sample of houses to be almost equally divided into ' structured ' and 'unstructured', with most of the 'structured' being shallow and the 'unstructured' deep. Thus generally the houses are for the most part classifiable into legible or anomie. One surprising result is that houses in the hierarchical group are not as prevalent as one would have thought.

Based on the analysis of the 5 main functional spaces and the exterior the overall basic *inequality genotype* is of the order C > B > A > D > E > Os, up to a certain social and syntactic size; beyond that another significant though smaller *inequality genotype* becomes evident. This is of the order B > A >< C > D > E > Os, where the sign >< is understood to be the interchangeability of spaces. However these are the theoretical *inequality genotypes.*, and in actual fact four *inequality genotype prevail.* ; these are **C > D > A > E > Os** , **C > A > D > E > Os** , **C > A > E > Os** and **C > A > D > Os > E**. That these *inequality genotypes* persist irrespective of the house inhabitants ethnicity, occupation, economic position or geographical location of the house is a taken as evidence of a strong spatial culture.

PART THREE :OF PLACES OPEN AND SPACES VAST

I Lament The Time That Passes Past

Lost Here While The More I Linger

Reminiscing Of The Occasions Of Hunger

Of Places Open And Spaces Vast

That On Me Bear Down ! Down ! Down !

That Of Make An Honest Doubter

This Morning Day An Ardent Believer

This Here Night Of Dark I Waver

Lost Betwixt The Forces Not Neuter

Looking For The Sources Of Light! Light! Light!

And I Here Rue The Chances Perfect Missed

Not By Self Inclination Nor By Choice

But For A Nature Sheer , Akin To Ice

That In Me Accrued, And Over Time Classed

Me, And Me Alone Mad ! Mad ! Mad !

(**Lamentations V:** AA Muhammad-Oumar 1979)

CHAPTER NINE : SUMMARY AND CONCLUSION

9.1. An Overview

This work set out to study the domestic architecture of the Hausa as a social expression of their culture and *weltanschauung*. The concern is not with the building processes although some aspects of that had to be, of necessity touched upon; nor is it with the engineering or climatic solutions to the problems posed by domestic architecture, although certain aspects of this were also touched upon. The main concern was to establish the basic spatial characteristics of the house and explore how these characteristics relate to the Hausa socio-cultural paradigm; how the house is conceived, how it is perceived, how it is lived and how it is related to.

From the information collected and the analysis of the data, certain categorical statements may be made about the physical aspects of the Hausa house and its milieu. To begin with houses come in all shapes and sizes. Despite the wide variations in the magnitude of the floor areas both within and across the houses, there is considerable consistency in the mean total floor area per house and also in the mean of the respective areas of the main functional spaces. This is regardless of family size or geographical location of the houses. Interestingly no two houses in the sample are or look the same. Every house is unique and there are no formula designs. This means every house bears the individual imprint of its inhabitants.

There is a strong relationship between the number of families and the total floor area per house. No such relationship is evident between the house population and the dimensions of the house as a unit, nor the size of its functional spaces, except perhaps the total *ɗaki* area which is the best predictor of the number of occupants in a house.

Two other observations about the dimensions of the houses are worth emphasising, and these are the concept of the spatial flexibility of the house and room occupancy rate. Hausa culture is fastidious about the "one-adult-one-room" rule. As we noted (supra **§ 7.2.3**) many respondents have attributed the inadequacy of their houses to the lack of an adequate number of rooms therein. Inspite of this the room occupancy rate of 2.67 recorded for the sample does not in any way indicate a realisation of, or a feeling of overcrowding in the Kano populace. The reason for this is simple; the *ɗaki*, as we have seen (supra **Chapter 7**) is not the only space for sleeping or any other quotidian activity. The importance of the *ɗaki* lies in its being the only place of procreation and hence the most personalised space. For the Hausa therefore, only where there is a lack of place of intimacy for an adult or at worse between married couples would overcrowding be indicated.

Aside from the obvious climatic advantages, the ratio of the open to built up space, or what was termed Opacity has certain socio-economic implications. The amount of unbuilt space in a house or settlement is a measure of its flexibility as a spatial system. Within the usually very high enclosing walls, the concept of *sheka* or fallow space permits the inhabitants to increase or extend, decrease or demolish new or unwanted functional space as the case maybe. This is as true of the house as it is for the settlement. Thus unlike what obtains in other cultures, spatial flexibility in Hausa domestic houses goes far beyond the ability to partition more or less fixed spaces only, it also entails the potential to create and recreate spaces as the need arises. That the mean Opacity of the individual house in Kano is approximately 25% is not only an evidence of the urbanity and the consequent optimum use of the Kano lands, but also lower cultural ideals compared to other Hausa urban milieus.

It is interesting to note that Opacity for most of the houses is almost the reverse of the ratio of built up to open area in the Kano urban space. Whereas at the settlement level no more than one third of the urban land is allowed to be built upon, on average about a quarter of the total floor area is invariably left unbuilt at the level of the domestic house. In this important respect the individual house is very much akin to the settlement.

An important observation got from the study is the fact that house ownership, individually or collectively, is about nine in ten, a characteristic perhaps unique to the Walled City in the Kano urban environment. As we noted above this has strong implications for social homogeneity and cohesion. In most cases, house possession is by inheritance, rather than through purchase. This trend seems very likely to continue. Incidence of house purchase though rare, is not unknown.

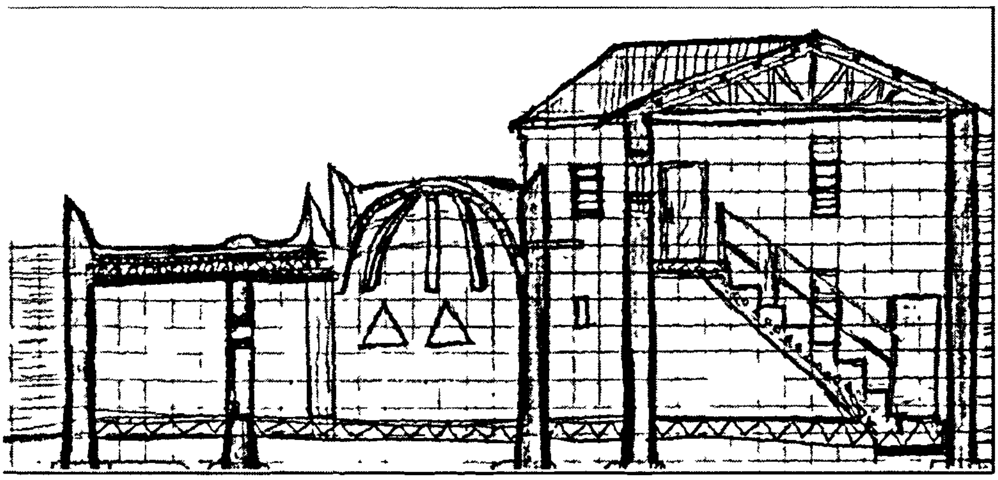

FIGURE 9.1 : TYPICAL HOUSE SECTION

Another way through which a house could be owned is of course, to construct it anew. In fact there is strong evidence to show that most of the houses surveyed were constructed or modified, physically rather than spatially, in the period between the two wars, that is 1918 and 1939. [181] These years coincided with the first economic boom of the colonial period.

[181] Sa'ad (1981:267) sees this period as the *bel epoque* of Hausa architecture. This is perhaps right, but naming it the 'classical era of traditional Hausa architecture' is going a little bit too far. The main physical and spatial themes of Hausa Architecture were perhaps formulated and actualised in the 15th century (Logan 1929:403). They were perfected in the 18th century as Sa'ad himself recorded (1981:209; See also Schwerdtfeger 1982 & Moughtin 1985). It would therefore be more appropriate to consider any of these periods as the 'classical period', rather than the period when these ideas were merely elaborated upon.

Houses forming the sample are were mainly constructed of *tubali,* the hand moulded sun-dried mud bricks. The walls were then plastered with a cement sand mixture. This type of wall finishing has almost completely supplanted the more traditional *makuba* finish. Roofing with *azara* or deleb palm rafters is still common, although increasingly limited to the flat roof. *Baka* , or arch-roof is found in only a small number of the houses. However there is a growing tendency to prefer contemporary building materials, most especially in roof construction. Thus while many would be satisfied with cement plastered walls, many prefer to have their houses re-roofed, or have existing roofs covered with corrugated metal sheets. Thus a substantive number of the houses surveyed would look like the section in **Figure 9.1**

Having noted this, are we then to take the current state of affairs evidence of the decline of indigenous Hausa architecture ? There are two broad aspects of architecture that need to be considered in order to answer this question; spatial conception and the art of building itself.

Most of the Hausa builders have been strongly influenced by contemporary building materials and construction components and methods. While some have taken these new ideas in toto, some have tried to adapt their indigenous skills to the new architectural dispensation . The result is a serious decline in the art of indigenous building construction and a consequent low building standards. Despite this buildings are still constructed in mud, though roofed with corrugated iron sheets, especially in the rural and semi-urban areas. One need only look to those areas at the urban periphery or squatter settlements to confirm this. The reason is simple; for many a Hausaman this is still the most viable option for constructing a house.

Thus it is not surprising that the physical state of the house is currently the chief concern of most of *masu gida*, the house heads. The major reason behind the prevalent drive to modify or reconstruct part of, or even the whole house, has to do with the current high maintenance cost of the traditional building materials. One hastens to add that, this cost does not necessarily mean in monetary terms, but in terms of time and labour. Traditionally building construction was a communal effort, except for the aristocracy and the very rich. The same with maintenance. Where communal spirit is absent or weak, as the case in contemporary urban settings, the traditional building process is bound to suffer. Of course there is in addition the idea of fashion, though weak, and all that associated with it. The aspect of building art that has seriously suffered from this development is ironically, what many see as the best contribution of the Hausa to, and the greatest achievement of, indigenous West African architecture, that of arched roof construction. There can be little doubt that or what the Hausa call *baka*, or to give it its literary name, " *la vault Houssa*", is the one architectural element that distinguishes Hausa architecture.

The spatial quality of the house , i.e. the arrangement, location and orientation of the principal functional spaces within the house is satisfactory to most house inhabitants. What seems to worry most is the number of *ɗakuna* or rooms, rather than their size or location; a clear indication of the

Hausa propensity for 'one adult, one room' ideal. However for many the location of the house is unsatisfactory. Given the choice a substantial number would rather live elsewhere. Interestingly most people would prefer to live in the more recent residential areas of the Walled City, rather than those areas outside and away from it. The few who preferred to live outside the Walled City, would rather live in the peripheral areas of the city that more or less, bear strong social affinity to the Walled City. There seems to be a strong aversion to living in those areas where the Hausa cultural norms are absent or weak. Thus although locally the location of the house may not be satisfactory, globally it is for most people. This, if anything is a strong indicator of the level of social cohesion.

Turning to the house as a discrete spatial system, certain facts become evident. First of all, every house in the sample without exception, has at least one *tsakar gida*, or courtyard; many have more than one, depending on the size of the house. Generally however, the number of courtyards in a house has a closer relation to the number of families in the house than to anything else. This is taking into account urban land constraints, and the fact that in some cases, a house is split between siblings at the demise of their father.

The courtyard is the syntactic centre of the house; it is a multi-functional space that is the focus of most domestic activities, social or economic, and thus the most extensively used space. Syntactically it is in most cases the shallowest space and the most connected. However socially it is the most private space from the point of view of the non-inhabitant. On the one hand social accessibility to it is severely restricted to all non-kindred adult males; at certain diurnal periods even to family members, making it almost wholly a gender exclusive space. On the other hand every part of the house is linked to the other parts of the house primarily, and in most cases exclusively through it. It is thus an 'ambiguous' space[182].

Similarly all the houses, have at least one *zaure*, or *soro*, i.e. entrance hall. This is another gender exclusive space which is considered the domain of the male. In many cases it well integrated despite being one of, if not the shallowest space from outside, i.e. it has the lowest 'absolute' depth value. In the "Big" houses it is usually more integrating than even the courtyard. The *zaure* is to the male what the courtyard is to the female; the focus of all diurnal activities, social or economic. Unlike the courtyard, the number and size of the *zaure* depends more on present or past family fortunes and / or position. However there are few cases where the *zaure* serves as the place of work. In such cases its size may be utilitarian. More often than not the size of the *zaure* bears little or no relation to the number of occupants in a house. Aside from the main outer *zaure*, it is not unusual to find one or more inner *zaure*. Where this is the case the inner *zaure* exhibits

182 Calloway (1984) is of the opinion that because they are secluded, " Hausa women may be said to live a life of ambigous social polarisation." It is interesting to note that the one spatial entity which Hausa women dominate and have absolute control over, is the syntactically 'ambiguous' *tsakar gida* or courtyard.

properties that are in consonant with another space, the *ƙofar gida.* , this will be discussed below shortly.

Again every house has at least one *ɗaki* or room. This is the most intensively used space in the house. It is a gender restricted space, depending on the time of the day and its location in the system. Unlike both the courtyard and the *zaure*, the number and size of the *ɗaki* is closely related to the house population. Thus the *ɗaki* is more utilitarian than otherwise, and the *zaure* more symbolic. This means that unlike what obtains in other cultures, the number and size of room has less to do with the family wealth and more to do with the family size; family wealth tends to be expressed in the *zaure* and family size in the *ɗaki* . Syntactically it is minimally connected and usually the most, or one of the most segregated spaces in the house. In almost every house one finds the *ɗaki* to be the space beyond which there is no space, i.e. , the deepest space from outside.

It is interesting to note that the *zaure* and the *ɗaki* are the two spaces that are traditionally well decorated. The difference is that the former is usually has its roof and walls decorated while the latter has its floor and what covers it, for instance mats, well decorated. The hallmark of a good *zaure* is in its roof and wall finish while that of the *ɗaki* lies in the quality of its *daɓe* or flooring and the beauty of its matting or beddings. Thus the decorations of the *zaure* are much more fixed while those of the *ɗaki* are much more movable [183].

These three spaces, *zaure* , courtyard and *ɗaki* together with a function-specific service space, the *banɗaki* or toilet, are found in every house in the sample. They constitute what may spatially be termed 'universals'. In simple terms no house is fully constituted if any one of these spaces is missing.

There are three other basic space types in the house. These are the *ƙofar gida* or outer yard , the *rumfa* or inner hall, and the ɗakin *girki* or kitchen. The *ƙofar gida* is in many respects a *zaure* without roofing. One advantage it has over the *zaure* is that it is at least one step away from the exterior of the house. Like the *zaure* it is a shallow male oriented space and in many cases considered as its spatial extension. Hence it is used by males for living, eating and socialising. However because in many cases it connects directly to a courtyard it is possible to appropriate it by the adult females for economic endeavours. Syntactically it is unstable especially in the smaller single family houses. Nevertheless in the "Big" houses it becomes more significant in that it is normally well connected and usually the integrating space. In fact one would be so bold as to say that physically and syntactically it is what distinguishes the smaller more common house from the larger communal house, the so-called "Big" house.

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[183] In the wake of the first groundnut boom it became fashionable to stick multi-coloured plates on the walls of the ɗaki in the mid and low income group houses. This was probably an imitation of sticking polished mirrors in the walls and ceilings of the *zaure* of in the houses of the nobility. The fad died off in the early 1960 s.

The *rumfa* is to the *ɗaki* what the *ƙofar gida* , the outer yard is to the *zaure*. It is a female oriented space and almost invariably leads to the *ɗaki* , but it is not as segregated. Female adults use it as an extension to the *ɗaki* while children use it for eating and sleeping. Its adjacency to the *ɗaki* makes it open to use by males at least nocturnally, but sometimes even diurnally depending upon its depth from the exterior.

Finally the cooking place or ɗakin *girki* , where it exists is a minimally connected and well segregated service space. These three spaces are not 'universals', in that there are many houses in the sample that are without one or even all three spaces. For example, where there is no cooking place, cooking is conducted in an inner *zaure* , or at the *murhu* or hearth; invariably an area appropriated from the courtyard. And as we noted above, the *rumfa* is also used for sleeping and reception, functions mostly conducted in the *ɗaki* . It is for this reason that one could conclude that these spaces are but extensions of the 'universals'.

The house as a spatial system exhibits certain syntactic peculiarities. First, most of the houses have tree-like justified graphs, attesting to a strong spatial hierarchy. However quite a significant number of the justified graphs exhibit 'rings', most of them external. These rings seem to be remnants of the days when some *masu gida*, the house heads, practised their crafts and produced their wares at home. That these rings are much more prevalent in Fuskar Gabas the East sector, an area considered the most economically productive zone of the City, than anywhere else strongly supports this argument.

Second, integration cores tend to be shallow in houses with external rings, but in most cases integration cores are mid way between the 0 level and the n-th level of the justified graph. The core almost invariably contains the courtyard. It rarely contains the exterior, which is either the most segregated space or falls within the 33% most segregated spaces.

Third, service spaces like the toilet and the cooking place tend to be well segregated even where they are adjacent to a well integrated space. These as earlier noted are function specific spaces.

Finally, there seems to be very little difference between the syntactic properties of the houses when considered with the exterior and also when considered without the exterior.

Syntactically the houses fall into two basic *inequality genotypes* and several phenotypes. The first is of the order C > B > D > A > E > Os and the second is of the order B > C > A > D > E > Os. The former is the most common and prevails in the single family and syntactically smaller houses, while the latter is more associated with the socially "Big' and the syntactically larger houses. In either case the tsakar *gida* or court is almost invariably the most, or one of the most integrated spaces; it is never segregated. Conversely the *ɗaki* or room is in most cases the most segregated space; it is never well integrated. However, if the exterior is considered part of the system, it becomes the most segregated space in the system ; it is never integrated. One other characteristic further defines these genotypes; that is where they exist the *rumfa* and the *ƙofar gida*, are usually well integrated.

In actual fact however four main configurations, namely **C > D > A > E > Os** , **C > A > D > E > Os** , **C > A > E > Os** and **C > A > D > Os > E** prevail irrespective of the house inhabitants ethnicity, occupation, economic position or geographical location of the house. Several other configurations also exist; these are the phenotypes[184] which could be seen as the result of variations on a theme; that of the syntactic and social centricity of the courtyard, and the eccentricity of the designated sleeping and cohabitation spaces, i.e. the *ɗaki* . This spatial disposition is universally manifest; that is across the sample, the basic genotypes and phenotypes are pan -social and pan -geographical .

The discrete separation of physical space apparent in the house, which tends to separation and exclusivity in the social space, permeates the society at large. It is evident in the house, as it is in the urban settlement . There is thus a continuity in spatial relations between the logic of the domestic interior and the levels of external space at a local and global scale. For this reason the Hausa house is best seen, in many ways as an inversion of the Hausa settlement.

First, at the domestic level, the *tsakar gida*, the courtyard[185] is the focus of social life; at the settlement level, the *kasuwa* or market is the social core. This is quite unlike the spatial order prevailing in many West African cultures, for instance the Yoruba, where the palace is the focus of all social activity (Krapf-Askari 1969:39). By the same token just as the courtyard is the domain of the female, and the adult male is banished from it, so also the market is the domain of the male and the adult female is banished from it. In syntactic terms both the courtyard and the market are the integrated spaces, while the segregated spaces are the ɗaki or room, and the *unguwa* or ward, respectively.

Second, in urban areas at least, the smaller the urban unit, the more the tendency for its open spaces to be central, and the larger the unit the more the tendency for its open spaces to be peripheral. Thus for instance at the domestic level, courtyards are almost invariably enclosed by rooms, but at the settlement level open spaces tend to be extraneous to the residential quarters. At the ward level open spaces could be either. It is this continuity between the open and the closed elements that gives shape to the precise temporal forms of the Hausa spatial tradition. One could thus envision the Hausa spatial system as composed of open and closed elements, not unlike a series of concentric circles.

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184 The first has C=D>A>E>Os and C>D=A>E>Os as main phenotypes ; the second has C=A>D>E>Os ; the third has C>A=E>Os; The last has C>A>D>Os=E and C>A>Os>E>D. In addition one could also look at C>A>B>D>E>Os, C>A>D>B>E>Os, C>A>D>E>B>Os and C>B>A>D>E>Os as phenotypes of the first basic *inequality genotype* , i.e. C > B > D > A > E > Os. (See supra **§ 8.3.2**)

185 Strictly speaking this is better translated as the cortile rather than the courtyard. However the use of courtyard has become very prevalent in literature, hence its retention.

Judging from the sample of houses analysed, it seems that the Hausa house is configured in a way that ensures at the very least three things; one discrete demarcation of physical spaces, two a strong bias towards diurnal gender restriction and exclusivity in quotidian use of space, and three ' non-kindred' control in social space accessibility; the word' kindred' taken not only in the common sense of blood relationship, but also in the less common sense of close social relationship.[186] These then are the cultural determinants of spatial form, or what Hillier & Hanson (1982) termed ' spatial codes'. From the preceding it seems these spatial codes are based upon two ingrained norms guiding Hausa social conduct. The first is the strict principle of division of labour by which not only male is distinguished from female , but also the aristocrat from the proletariat; the second is the principle of social hierarchy by age. It is the spatial implications of these principles that result in the observed pattern of spatial configurations.

Carrying the argument to its logical conclusion it follows then that certain Hausa urban lifestyle factors override many individual distinctions, for instance ethnic, and historical influences, for example colonial, to produce a form of domestic organisation that is uniquely Hausa. Houses may not bear the imprint of where people come from but what they aspire to be. Therefore it is not surprising to see that the houses in the sample could be distinguished neither by the ethnicity of the inhabitants, nor by their economic pursuits.

This leads to the big question of the relationship between Hausa spatial codes and Islam. Are these codes attributable to purely Islamic prescriptions or are they manifestations of Hausa culture ? As noted earlier (supra **3.5**), Islam has so permeated the Hausa culture that for some it is the sine - qua-non of being Hausa . Yet while in many cases it is not possible to distinguish the purely Islamic norms and the purely Hausa, certain norms that derive from Hausa culture are still distinguishable, for instance the economic autonomy of the Hausa female. This is a clear example of social dispensation not immediately perceptible in other African Islamic sub-cultures. That the non-Muslim Hausa women, the *maguzawa*, are so disposed strongly suggests that this is a Hausa social dispensation reinforced by Islam. Again Islam recognises social hierarchy by age without institutionalising it in the society, let alone fine tune it to the level acceptable in Hausa society.

It is thus possible that there are many aspects of pre-Islamic Hausa culture whose realisations uphold the Islamic way of life. One thing which must not be overlooked, is the fact that most social behaviour acceptable to Islam is based upon few injunctions. That the Hausa have been thoroughly Islamised, probably more than any other sub-Saharan ethnic group, is perhaps due to the Hausa propensity for a " live and let live " world view, and the consequent congruence of many of its social norms and those of Islam. Also undoubtedly the 19th. century Jihad of Usman 'Dan Fodio had a lasting effect of reinforcing this tendency.

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[186]The Hausa word *dangi* used for relations, expresses this idea much more succinctly (See supra § **7.2.2**).

Before we end this study, two possible objections need to be addressed. The first is how representative is the sample of houses that has been the basis of the analysis ? Are 160 houses from a universal set of perhaps over 30,000 [187] houses statistically significant enough to be able to draw far reaching conclusions? The second is would not an analysis based on mean figures carried too far lead to distorted results because mean of means is unrealistic ? And the last is how representative of Hausa culture are houses from Kano? In other words could one use what obtains in Kano to generalise about the Hausa?

It is outright granted that 160 houses out of a possible 30,000 houses or only 0.5 % is in numeric terms statistically insignificant. However, the houses selected could account for every possible parameter; ethnicity, occupation, geographic spread, social status, economic disposition, political hierarchy and religious inclinations. In this way the sample is statistically representative and hence the results broadly significant.

Secondly, the analysis of the data was multi-faceted, but more importantly the results have throughout been consistent.

Finally, it is true that Kano is the one Hausa city which is a pot-pourri of sorts, an amalgam par excellence, and apparently the Hausa city with the highest number of non-Hausa people. But that is precisely what Hausa culture is all about. To begin with Hausa culture is highly urban, and few will argue with the statement that Kano is the most urban and urbane of the Hausa cities. Also it generally accepted that Hausa culture is highly assimilative and consequently highly dynamic. Nowhere in Hausaland is this assimilative process more marked and obvious than in Kano. In Hausaland therefore , Kano is the place to be if one wants to get ahead. The great Hausa poet laureate, Mu'azu Haɗejia has this to say of the city;

Kano Ta Abdu Sha Yabo *Duk Wanda Ke Biɗar Rabo*
Akwai Shi Can Zubo-zubo *Ka Tabbata Fa Modibbo*
Domin Faɗa Ta Gaskiya

Meaning;

Kano (the city) of Abdu, full of praises He that his fortune seeks
Therein he wily-nily resides Of that you can be certain, Oh learned one
Forsooth it is the truth. [188]

To conclude what can we abstract about the ordinary and common Kano house and by extension the ordinary or common Hausa domicile? In other words having gone through the heady data, the

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[187] In 1963 Trevallion (1966:28) estimated that there were over 28, 000 houses in the Walled City. If one assumes that over a period of 30 years the number of houses in the Walled City has increased by 10 to 15 % were as a result of house splitting due to inheritance and new house constructions, then the number of houses currently would be between 30,800 and 32,200 houses.

[188] This is the opening stanza of his epic poem " ***Tutocin Shehu Da Waninsu.***"

copious analysis and the sometimes confusing array of figures and statistics what can we say in simple everyday language about the essential aspects of the ordinary Hausa house ?

To begin with there seem to be two basic ordinary house types. The first is characterised by accommodating one or two families, more rarely three. This type of house has on average two entrance halls or *zaure* and, depending on the number of families and economic wherewithal of the inhabitants an outer yard adjacent to the *zaure* and called *ƙofar gida.* . This leads to a single *tsakar gida* or courtyard, sometimes two courtyards. The house would have at least one room called *ɗaki,* or several of these depending largely on the number of adults living in the house. These rooms may or may not all be accessible via an ante-room called *rumfa.* In rare cases two such access spaces are found preceding the *ɗaki* one after the other, but the second space is invariably referred to as a second *ɗaki* rather than a second *rumfa* . Thus, to reach the *ɗaki* which is at the deepest part of the house, one has to pass through several spaces. This type of house could be and in a substantial number is, two -storeys but never more.

The second type of ordinary house is characterised by accommodating three or more families. It differs from the first type of house in that it almost always has a *ƙofar gida* or outer yard, sometimes two or more. It is also characterised by having individual families in sections called *sashe* (also *waje*). These sections may be accessed from the *ƙofar gida* via respective individual entrance halls or *zaure* (also called *soro*). To all intents and purposes these sections are self-contained dwellings that share at least one common entrance hall and one or more common *ƙofar gida* or outer yard. There may be as many as 8 or more such sections, in which case such a house is termed *babban gida,* or "Big" house[189] . Again parts of such houses could be two storey but never more.

What is common to these two types of houses are first, the three main functional spaces, namely the entrance hall, the courtyard and the room (i.e. *zaure, tsakar gida* and *ɗaki*). Secondly, it seems the number of courts depends on the number of families while the number of *ɗaki* depends on the number of adults accommodated in the house. The number, size and roof construction of the *zaure* depends on the social status and the economic disposition or occupation of the house owner. To a large extent this is also true of the ante-room or inner hall , the *rumfa* . The main difference being that the *zaure* is more symbolic than utilitarian. On the whole there does not seem to be any rule about the sizes of the main functional spaces. Dimensions are a matter of personal preference, hence the uniqueness of each and every house. Thirdly, most of these houses are constructed using adobe but where it is possible there is a strong tendency to prefer building materials that require least effort in maintenance[190] .

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189 It is interesting to note that the King's palace is traditionally refereed to as "The Big House" Other "Big" houses are always distinguished by a qualifier, for instance the "Big" house in such-and-such place or belonging to so-and-so family etc.

190 This at the expense of even climatic comfort.

9.2. Theoretical Framework

Having said and done all , could one posit a house that is a realisation of the essence of all the above abstractions ? In other words can we use the basic principles delineated from the analysis to come up with a design of a house that will, *mutatis-mutandis*, meet with the approval of *Mallam Bahaushe* [191] ?

To meet with the approval of *Mallam Bahaushe* , the house has to fulfil two basic preconditions. Firstly, as it was brought out in the analysis the majority of the Hausa houses accommodate single families. Even in houses where there are more than a single family for instance the " Big Houses," almost invariably these families have agnatic relations, except where the house is a rooming house (supra **§ 3.5 & 5.5**) . This is so most especially in the big Hausa urban areas like Kano.

Secondly, the house has to be flexible enough to meet the spatial requirements of a "family"[192] whose size is traditionally never static. This is a characteristic of a Hausa house especially in the more rural environment, though more difficult to realise in the urban areas. Even then it is not uncommon to find a house accommodating three generations of a " family", that is a man , at least one of his aged parents and one of his married offspring. This flexibility is achieved by means of *sheka* or fallow space within the confines of the house. With these preconditions in mind what a quintessential [193] Hausa house may look like is presented.

Figure 9.2 shows a sketch of an imaginary house that is believed would, *mutatis-mutandis* satisfy a *Mallam Bahaushe* . There are five important things to note in studying this quintessential house. Firstly, the house has four different stages of growth which we may term, the **minimal**, the **prevalent,** the **mature** and the **optimum** stages.

In the **minimal** stage it contains the four "universal" Hausa domestic functional spaces as enumerated above, namely the *zaure* (entrance hall), *tsakar gida* (courtyard), *ɗaki* (room) and *banɗaki* (toilet). More often than not it may also have one non-universal but dominant functional space, that is the *rumfa* . More importantly it has a considerable size of *sheka* or unbuilt space. What is interesting to note is that the ratio of the sheka to the built up area is approximately 3:1. This ratio is what obtains at the settlement level as noted earlier (see also infra **Appendix 1**).

In the **prevalent** stage the house expands to contain one other dominant functional space, namely the *ɗakin girki* (cooking place). In addition there are two more room suites (*rumfa* and ɗaki), while what used to be a single *ɗaki* in the **minimal** stage now becomes a second *zaure* .

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191 This term is the Hausa equivalent of the elusive "Mr. Average" or " Joe Public".

192 Not in the sense of a nuclear family, but in the sense of an " extended" family. See supra **§ 3.5**

193 One shies away from the word "ideal" because of the philosophical connotations. Hence the use of "quintessential"; a less value loaded word.

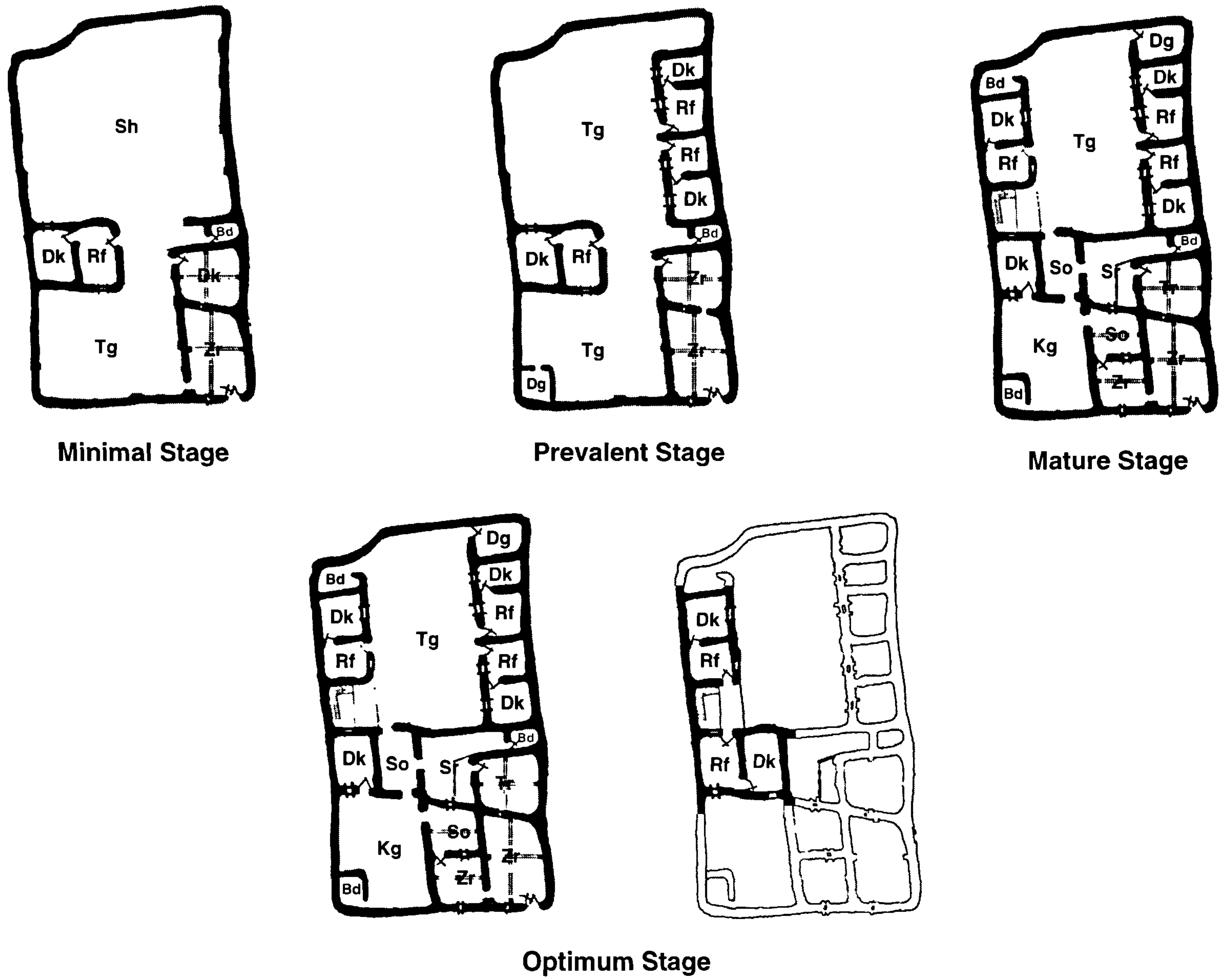

FIGURE 9.2 : FOUR STAGES OF A QUINTESSENTIAL HAUSA HOUSE

Zaure (Zr); Soro (So);Kofar Gida (Kg);Tsakar gida (Tg);Rumfa (Rf);Ɗaki (Dk); Turaka (Tr); Sarari (Sr); Banɗaki (Bd);Ɗakin girki (Dg);Sheka (Sh)

In the **mature** stage the house grows and re-configures; it grows to include another dominant functional space, that is the *ƙofar gida* (outer yard)[194], two more outer halls (*zaure*; pl. *zauruka*), at least one other room suite, a new *ɗakin girki* (cooking place) and one other toilet. It re-configures such that a private apartment is carved out for the *maigida* (the house-head) containing three functional spaces; what used to be the second *zaure* in the **prevalent** stage which now becomes the *turaka*, (a private room for the *maigida*), what used to be the only toilet in the **minimal** stage, and a private open yard called *sarari*. In addition what used to be a room suite in the **prevalent** stage converts into an inner hall (*soro* ; pl. *soraye*) and an outer *ɗaki*, while what used to be the cooking place now becomes an outer toilet.

In the **optimum** stage the house grows to include an upper storey with one or two room suites as the case may be.

What should particularly be noted is that the stages are not uni-directional. In other words much as it is possible to find a case where a house grows from the minimal to the optimum stage, it is also perfectly possible to envisage a case where the house starts at the optimum stage and contracts to the minimal stage for any number of reasons. One other thing that needs pointing out is that, where necessary a well is an integral part of the Hausa house and could be found in any and every one of the stages enumerated.

Secondly, the sketch though in approximate proportion, is not to any particular scale. The sizes of the functional spaces will depend on the location of the house, availability of land, wealth and social position of the " family ". The only controlling factor is the *opacity* of the house. This as was brought out in the analysis (supra § 6.4) should not be less than 0.25 and should not exceed 0.45 in urban areas. However in rural areas it could be as much as 0.6. This brings out another interesting difference between the rural and the urban Hausa house.

Thirdly, although traditionally the Hausa use adobe as a building material and wood for building components like doors, the house could be built at every stage using other than these traditional materials. It could also be constructed using any combination of building materials and components.

Finally, it should be remembered that the final form the house takes will naturally depend on the spatial dimensions and the building materials and components used to construct it. As noted, the Hausa building tradition tends to emphasise where possible, the volumetric size of the *zaure* and the superficial dimensions of the *tsakar gida* (courtyard). Other aspects of the house that the Hausa emphasise include the roof decoration and both the internal and the external wall finishes

[194] Note that what used to be the *tsakar gida* (inner courtyard) in the first two stages is now isolated from the inner parts of the house by the *soro*, and hence it becomes a *ƙofar gida*. Thus the difference between the two types of spaces lies in accessibility and depth from outside.

and decoration. For this reason the cross-sections of the house are not sketched since this will depend on so many factors.

From the foregoing one could begin to appreciate what the Hausa term as *gida* (plural *gidaje*). In its generic form it simply means house, but it also means home; building; family; household; place; world; portion and settlement. To the Hausaman his *gida* is more than his castle; it is his identity as well as the embodiment of his aspirations. Its basic characteristics entail all that is necessary for the establishment and the sustenance of the Hausa way of life. To him, a person who lacks a definitive association with a *gida* , lacks also a culture[195].

For this reason little could be really understood or even said definitely about the Hausa without an understanding of the Hausa domicile. However what this study has touched about the Hausa house is to quote Sa'ad (1981), " the tip of the iceberg." Despite all this however, one thing all the houses analysed and those imagined have in common but which no amount of data or inquiry could fully portray, is the potential to allow the inhabitants to lead a socially vibrant and an existentially meaningful and fulfilling, if rather boisterous life to the full. To fully comprehend and appreciate this one needs what the Sufis term, " *zawq* ", that is to experience it, " to be there and live therein " so to speak; being told would never do.

195 The Hausa word for the uncultured is " *bagidaje* " , i.e. one who has no association with a house.

APPENDICES

APPENDIX ONE

KANO TUMBIN GIWA[1]: SPATIAL MORPHOLOGY AND URBAN GROWTH PATTERN[2]

1 Introduction

It has been suggested above (Chapter 3), that the Hausa house is a space entity within a larger space entity, to wit the city ; the noas within the paranoas. There is thus the need, to understand the paranoas in order to fully understand the noas and vice-versa. As it had been shown, " the way space is structured - that is, organised into a pattern - has in itself remarkable strong effects on how buildings and built environments function" (Hillier & Penn 1994 :71). By the same token, " the layout of the house is also mirrored by the organisation of the settlement " (Pearson & Richards 1994: 15). This paper examines the urban form of the city of Kano and attempts to answer the following questions : What is the spatial structure of the city ? What laws govern its formation ? What factors, if any, influence its growth and development ? And finally, how does the spatial structure of the city at large, relate to that of the house ?

2.Three Generations of Urban Kano

In analysing the spatial structure of Kano use is made of maps of the city from three different periods, 1932,1963 and 1990. According to Fika (1978) British colonial administration reached its apogee in Kano between 1930 and 1940. By 1935 most of the major colonial policies regarding the urban form were put in place; the road networks, the drainage system, electricity supply and pipe-borne water networks and all the important public buildings, such as the general hospital. Also by that time the economic boom of 1920's groundnut era had been fully consolidated (Hogendorn 1978). Thus the first period represents the end of the transition of Kano from pre to colonial times.

The British handed over power in 1960 and this marked the beginning of the post colonial period in Kano. However prior to that, from 1955 the British had been gradually withdrawing from government under the policy of self -rule (Whittaker 1968). By 1963 the indigenous government , the so-called 'First Republic', was fully established. Although the post colonial central and regional governments were modelled after the British parliamentary system, the regional government policies clearly began to depart in essence, from those of the colonial government (Whittaker 1968; Last 1970; Paden 1986). The second period represents the end of colonialism and the beginning of the new nation.

During the oil boom era in the 1970's Kano, like most of the nation's urban centres, witnessed tremendous spatial expansions (Frishman 1977; Main 1988). New layouts, urban renewals and extensions were undertaken as a result of the economic prosperity. There were also trans-urban

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[1] Meaning "Kano is akin to the elephant's entrails", said by the Hausa in conversation to emphasise the city's complexity.

[2] In preparing this chapter I gained much from discussing with Mr. Kayvan Karimi, a postgraduate student at the Bartlett. I am grateful to him for his time and comments.

networks including axial thoroughfares, ring roads and by-passes. Naturally these developments changed the pattern of the urban fabric. While some were beneficial, many did not exactly achieve what they set out to do, i.e., improve the lot of the common man. By 1985 the great era of urban expansion and reconstruction was over but, as is common with other 'Third World' countries, the problems that arose out of it persisted. To some extent, one could argue, they still do. The third and final period represents the contemporary Kano urban environment .

The analysis of urban forms using the methods of Space Syntax begins with the production of the axial map of the settlement. Axial lines represent the longest and fewest lines of permeability and visibility linking the public open spaces, i.e., roads, alleys and squares on the settlement map. However axial lines do not have to correspond to the existing street pattern.

In syntactic terms, the size of a settlement refers to the number of axial lines that covers it, rather than to the metric size of the settlement. Configurational analysis simply put, is computing the relationship of the axial lines to each other. The measure of this relationship is *Integration* [3], or its converse *Segregation*.. The integration value of a line is the mathematical expression of the relative ease with which that line relates to all the other lines in the system. This is called *global integration* value, or **Rn**. In other words how easily accessible each axial line is from every other axial line in the system. Conversely segregation values are measures of how inaccessible, or syntactically speaking, how ' deep' a line is in a system. Thus a 'deep' urban system is one whose parts are generally far removed from each other, while a 'shallow' system is one whose parts are mutually easily accessible.

The integration core of an urban system is an arbitrary, though reasonable, percentage of the most integrated lines in the system. This percentage measure may vary , but of course, remains constant when comparing systems. The integration core of a system is its syntactic 'centre', or its focus of "the potential field of probabilistic co-presence and encounter "(Hillier et. al. 1987: 248).

3.1 Spatial Configuration Of Colonial Kano: 1932

Figure A1-1 is the axial map of Kano as it was in 1932[4]. The axial size of this map is 2025 lines. The overall shape of the axial map roughly corresponds to that of the city. It depicts the urban terrain as comprising of a complex network of criss-crossing axial lines of varying lengths.There is no direct axial link between one edge of the city to another, but there are three long axial lines that start at the edges of the urban terrain, and connect roughly, to the geographical centre of the city. Most of the axial lines are rather short with lines connected at angles, that range from acute to obtuse, but never at right angles to each other . Most are connected to no more than four other lines[5]. There doesn't seem to be any order or regularity about the pattern; it exhibits neither a grid nor a radial shape. Translated into real terms this shows that although there are many

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[3] Strictly speaking integration is the relative 'depth' of a spatial component - axial or convex - from other spatial components in a system that are x steps away from that component. Its where x is equal to the total number of steps in the system (x = n) that the integration value is termed **Rn** or global integration. Where x is equal to the mean 'depth' of the system from its most integrated line, the resultant integration value is termed **Rr**.

[4]The map used is Kano 1:12,500; Northern Nigerian Surveys Kaduna (1932 Ed.)

[5] These constitute 59 % to be exact, with the majority (19%) connected to only three lines. The mean connectivity is 4.2. This considerably higher than the mean connectivity observed by Hillier et. al. (1987 :238) for the 75 Western Europe settlements analysed at the UAS.

Figure A1-1: Kano 1932 Axial Map

dead ends or culs-de-sac, yet it is possible move laterally and ventrally within the urban fabric without retracing ones steps[6].

The processed axial map is presented as **Figure A1.2** This is the global integration / segregation pattern of the urban area. It shows a core with 'regional' characteristics, i.e. its " parts converge towards a common centre" (Peponis et. al. 1989:43). This core has three main features: First, the axial line that links *Kasuwar Kurmi, Masallacin Jumu'a,* and *Fada* to the Southeast, that is the main market, the Friday mosque and the Emirs Palace, respectively. Second, the two lines that form the Southeast and the Southwest boundaries of the market and connect to form the lopsided hexagonal ring which encompasses the market zone. These three lines form the 10 % most integrated lines in the system[7]. Third, and perhaps more interesting, is the second stage of the integration pattern which appears to form a 'second core' . This 'second core' intertwines, and almost completely encircles the first. It has what appear like 'spokes' extending to the edges of the urban system, except to the south. These well integrated 'spokes' connect the three gates of

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[6] Kano exhibits all the characteristics of the so called "Islamic city", namely, differentiation of public and private spaces; division of the urban fabric into self-contained units; hierarchical organisation of open spaces; and centrality of city facilities (Von Grunebaum 1961: Hourani (1970). But as Loumi (1988) has shown almost all 'pre-industrial' towns exhibit similar characteristics. For an illuminating discussion of the concept of "Islamic City" see Haneda M & Miura T (Eds) 1994 pp 1 -9.

[7]For comparative purposes an arbitrary percentage of the most integrated lines by number or by value is used. Here 10 % most integrated lines by value is used.

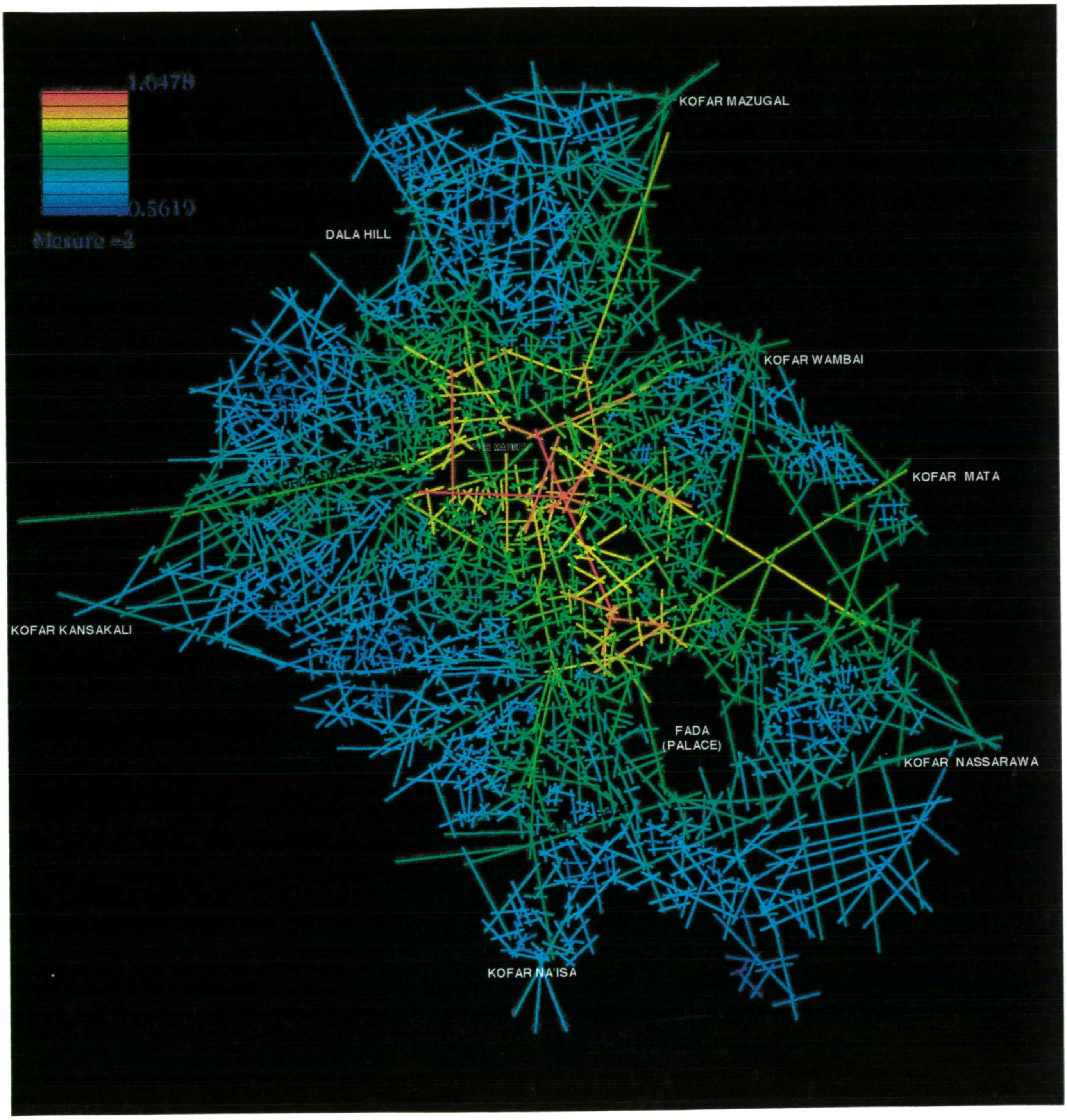

FIGURE A-1.2 : KANO 1932 GLOBAL INTEGRATION (Rn)

Kofar Mazugal, *Kofar Kansakali* and *Kofar Nassarawa* , and constitute the next 40% most integrated lines. The remaining lines which are segregated encompass this second core and fill in the interstices formed by its 'spokes'. Most of these segregated areas are to the south and to the west of the market area. In fact the Palace constitutes a boundary beyond which no area is integrated globally.

The urban structure unravelled is centred around the *Kurmi* market. This will come as no surprise to those familiar with the history of the city. From Kano's establishment as a settlement, *Kasuwar Kurmi* had been 'the market', or as Hallam (1964) puts it, the 'Great Emporium.'[8] In the period under discussion it was still 'the market', not only in the city but in the entire Kano Emirate and beyond. This functional space is what made Kano famous. However in Hausaland the market is more than an economic space (Smith 1965 : 219); it is a cultural space for three main reasons.

First, as noted above (Chapter 3) economic activity is never restricted to the market. Second, the market was the first port of call for new comers to the city. These could be people bringing trading articles to the city, who were required to declare them to government officials for tax purposes[9], or they could be strangers looking for something to eat and a place to sleep or even information about someone or something; the Hausa market was truly a place where one declares his presence. Third, and perhaps more importantly, the market was the one place where social codes were amply relaxed. Thus it is the place of performance for *makada* (popular musicians) *'yan kama* and *'yan gambara* (stand-up comedians), and a 'hunting' place for *karuwai* (prostitutes or courtesans)[10]. It is also the place where one could speak loudly or obscenely, and eat openly ; behaviour unbecoming of a person with self -respect.

The spatial position of the market[11], vis-a-vis the position of the socio-cultural spaces, indicates a powerful relation between the economic, the cultural and the socio-political life of the city. This is because not only is it strongly linked by globally well integrated lines to the spiritual centre of the city, the Friday mosque[12], and to the political centre, the Palace, but also directly linked to the three gates that traditionally were the gateways to the main trade routes to the north, east and to the west .

The 'second core' which completely encompasses the 'first core', seem to be composed mainly of those areas that have strong economic connection to the market. These are wards that specialise in

[8] The market covers an area of 12 hectares approximately. Shortly after the British conquest of Kano in 1903, one itinerary Englishman estimated that the population of the market on its busiest days was between 10,000 and 12,000. His observation was confirmed by the colonial staff stationed in the city (Raphael 1914:100). In the early 70's it had about 5000 closed stalls and 3000 open stalls. (Greenhill et. al. 1972 :148)

[9] It is interesting to note that only in the market are goods taxed (Barkindo 1983:13) and nowhere else. However those who have powerful political patrons do not have to go to the market but may go directly to their place of residence or to their patrons residence. In either case they were obliged to send word ahead of their expected time of arrival.

[10] The only category of women between the ages of 15 and 40 expected to be seen in the market at any time of the day.

[11] Studies show that in the late 1970's, *Kurmi* market was still the socio-economic centre of the city (Greehill et. al. op. cit.; KSUDB /Jagiello 1980) .

[12] Until 1968 this was the only mosque were Friday service was held

certain trades and crafts, vital to the economic existence of the market.[13] While some, like ***Tudun Nufawa, Gabari, Lallokin Lemu*** etc. can be considered virtually, its spatial extensions others, like ***Dukurawa, Dukawa, Soron Dinki*** etc., are connected trans -spatially. It is interesting to note the way the core coincides with the historic nucleus of the original Kano settlement (Palmer 1928; Dokaji 1978). The routes that radiate out from the market and reach outwards coincides with some of the gateways to the heart of the city. Two of these gates - *Mazugal* and *Kansakali* - belong to the first phase of the construction of walls around the city[14] (Barkindo 1983:14-23). And if, as it is suspected, the now obsolete *Kofar Kawungari*, at one time "the most southern of the gates" of the city (ibid :18), coincides with the northern entrance to the Palace[15], it would lend substance to the supposition, that the market has always been the nerve centre of the city and its focus of growth.

The most notable observation is that although movement through the city is never straight, and entails several changes of direction due to the lack of axial order, overall the city is highly structured[16]. The city's integration core shows it to be globally ' shallow ' from the outside, with a highly accessible centre, and a tendency for areas to be segregated, i.e. 'deep', the further away they are located from the core.

The local spatial logic shares many similarities with the global, but it is also different in certain respects. **Figure A1.3** is the local integration map of the 1932 city. Whereas the global integration core seems to be focused around the market, locally the 10% most integrated lines are manifestly diffused. Not one of these lines intersect the other. However the next 40% most integrated lines constitute a 'secondary core', which seems to permeate the whole urban fabric, and in fact reaches to the urban periphery. This secondary core seems to coincide with the global core in its (the global core's) essential aspects.

More importantly, this local core appears to be generated by well articulated thoroughfares that seem to link the edges of wards, the local sub-areas, making them accessible from several directions. The result is that almost all the edges of the sub-areas are well integrated while the nuclei are segregated. Internally then, the sub-areas form a well distributed tissue of segregated homesteads around integrating alleyways; what we might term 'contained segregation'. This is

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[13]In their socio-economic study of the Kurmi market, Greehill et. al. observed the close economic relationship between the market and its adjacent wards. "Kurmi market is dependent on and supports....the wards adjacent to (it and), depends upon them for its trading activities and services.." (op. cit. :26).

[14]The other gate - *Kofar Nassarawa* - was constructed only after the second phase of wall extension (ibid. : 19). However it is possible that another obsolete gate, *Kofar Gyartawasa*, existed along this route. If this is so, its location would probably be somewhere between *Shahuci* field and the area now called *Hanga*, the limit of the first wall. The fact that the strong integrating line passes this point, and stops just short of *Kofar Nassarawa*, may lend support to this argument. At any rate *Kofar Gyartawasa* is even today, sometimes identified with *Kofar Nassarawa*.

[15] Frishman (op. cit. :30) has identified the north entrance of the Palace with *Kofar Tuji* and placed *Kofar Kawungari* to the west of it . Dokaji (1978:13) has placed *Kofar Tuji* near *Kofar Kansakali* (perhaps *Kofar Kabuga* ?) . However it seems more reasonable to identify *Kofar Tuji* with the present *Kofar Wambai* as Barkindo (1983:18) has.

[16]For a full discussion on the difference between 'order' and 'structure' see Hanson (1988 & 1989). Simply put 'order' refers to the symmetry, proportion etc., in the visual perception of the geometry or gridiness of the plan or layout of a settlement ; 'structure' refers to the intrinsic quality of grasping the logic of a settlement by relating its parts to its whole.

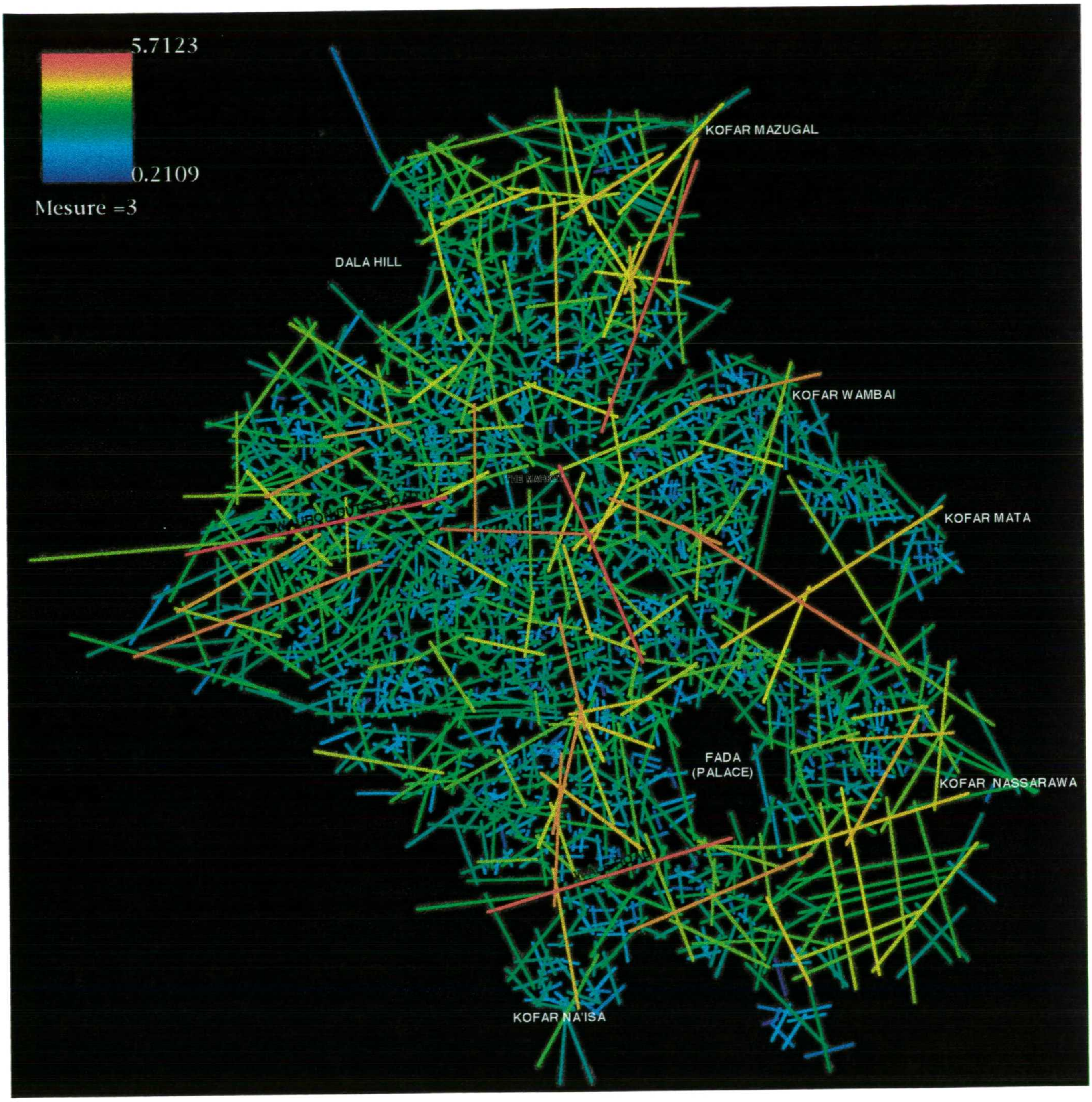

FIGURE A1-3 : KANO 1932 LOCAL INTEGRATION (R3)

apparently an inversion of the global integration pattern which, as noted, has the syntactic centre coincident with the geographic centre, and the periphery well segregated.

According to Hillier et. al. (1987: 237), the degree of 'structure' of an urban space " is indicated by the syntactic measure of *intelligibility.* This measure of intelligibility states in precise mathematical terms the degree of correlation between connectivity and integration which, "expresses the degree to which local visible properties of space are a good guide to the global and merely inferable position of spaces in the area as a whole", thereby capturing, "the intuitive sense" of the presence, or absence of "structure and intelligibility" (Hillier 1989:14).

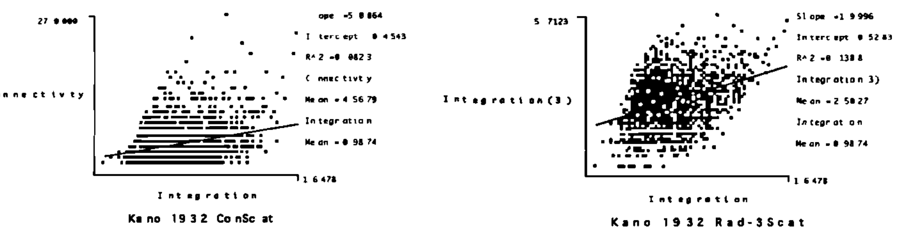

Figure A1-4: Kano 1932 ConScat / Rad-3Scat

Figure A1.4 shows the scattergrams of 1932 urban Kano. From the connectivity / integration scattergram (Conscat), the intelligibility value (R^2) of 1932 Kano , is **0.0823.** Compared to other urban systems this is considerably low. The value of the mean intelligibility of the 75 towns Western Europe settlements analysed at the UAS is **0.680,** while the 12 North African towns analysed by Loumi (1988) have a mean intelligibility of **0.536.** Taken at its face value, this indicates that the local and visible properties of the Kano urban system constitute a poor guide to the global properties of the urban fabric. That may arguably be so, but there could be two possible reasons for this observed fact; One is the syntactic size of urban Kano, for as noted by Hillier et. al., intelligibility "tends to decrease as the system grows "(1987:238)[17]. The other reason for this low value could be the practise of computing the integration values of only the 'distributed' urban system, i.e., the street pattern less culs-de-sac (Loumi op. cit.).

More recently the accord between global and local integration is used in determining intelligibility. To do this global integration is regressed with local integration. The Rad-3Scat, obtained for the 1932 Kano is 0.1388 (**Figure A1.4**). Again this figure is probably much lower than that of western European towns. However it is close to that computed for the another ancient city, the Iranian city of Shiraz whose Rad-3Scat has a regression value (R^2) of 0.1766 (Karimi & Hanson 1995).[18]Since these two cities share a lot of physical and cultural similarities, and since both were by disposition commercial towns, it is safe to assume that the differences observed in R^2 values between them and some of the 75 Europe settlements refered to above, could be attributed more to cultural differences rather than functional differences.

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[17]The *intelligibility* of isolated sub-areas of the city system tend to have a much higher value at **0.382** (Muhammad-Oumar 1993) , but still considerably lower than the mean of the 75 European cities.

[18]Again the regression value of the local to global integration of some Kano city isolated sub-areas is appreciably higher at **0.486** (Muhammad-Oumar 1993).

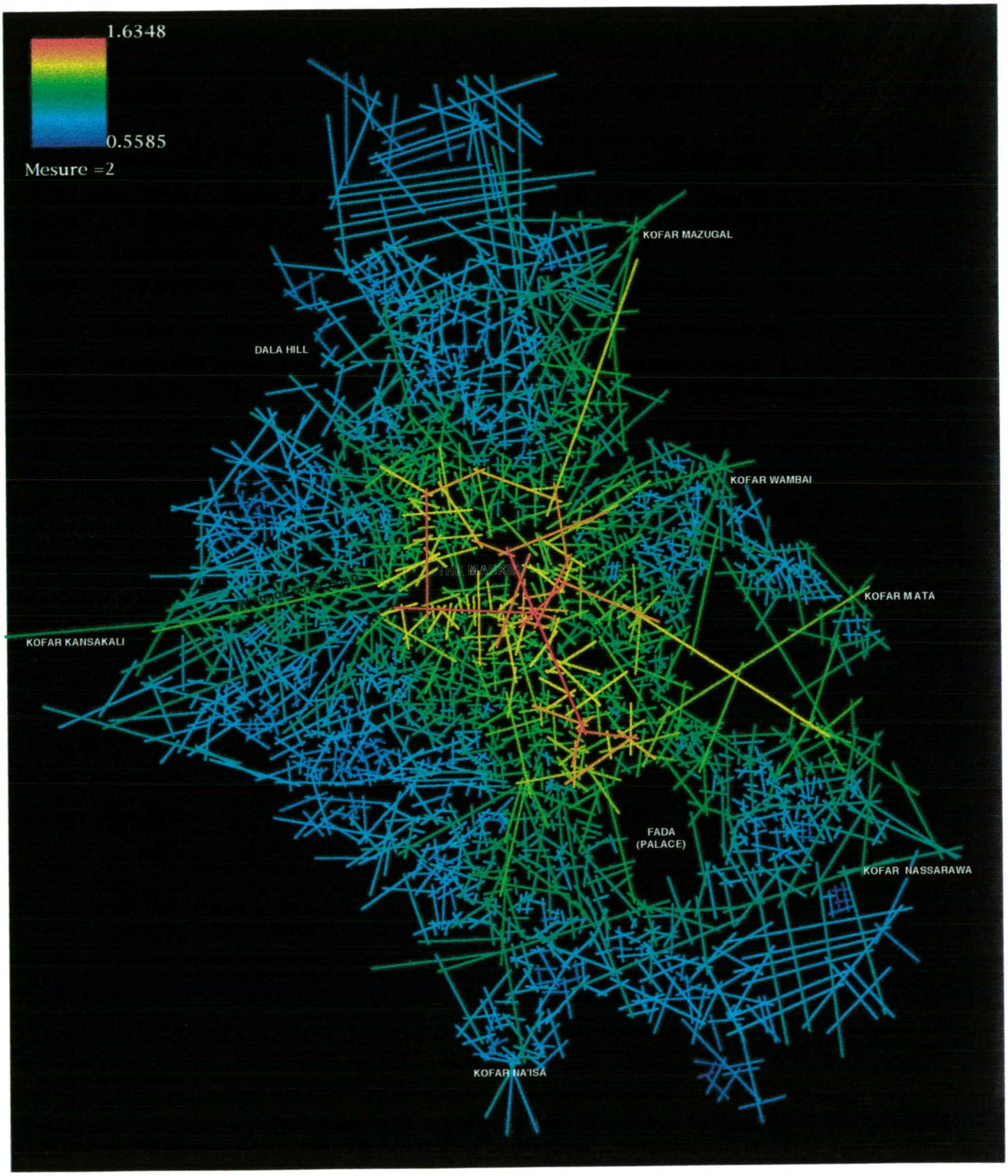

FIGURE A1-.5 : KANO 1963 GLOBAL INTEGRATION (Rn)

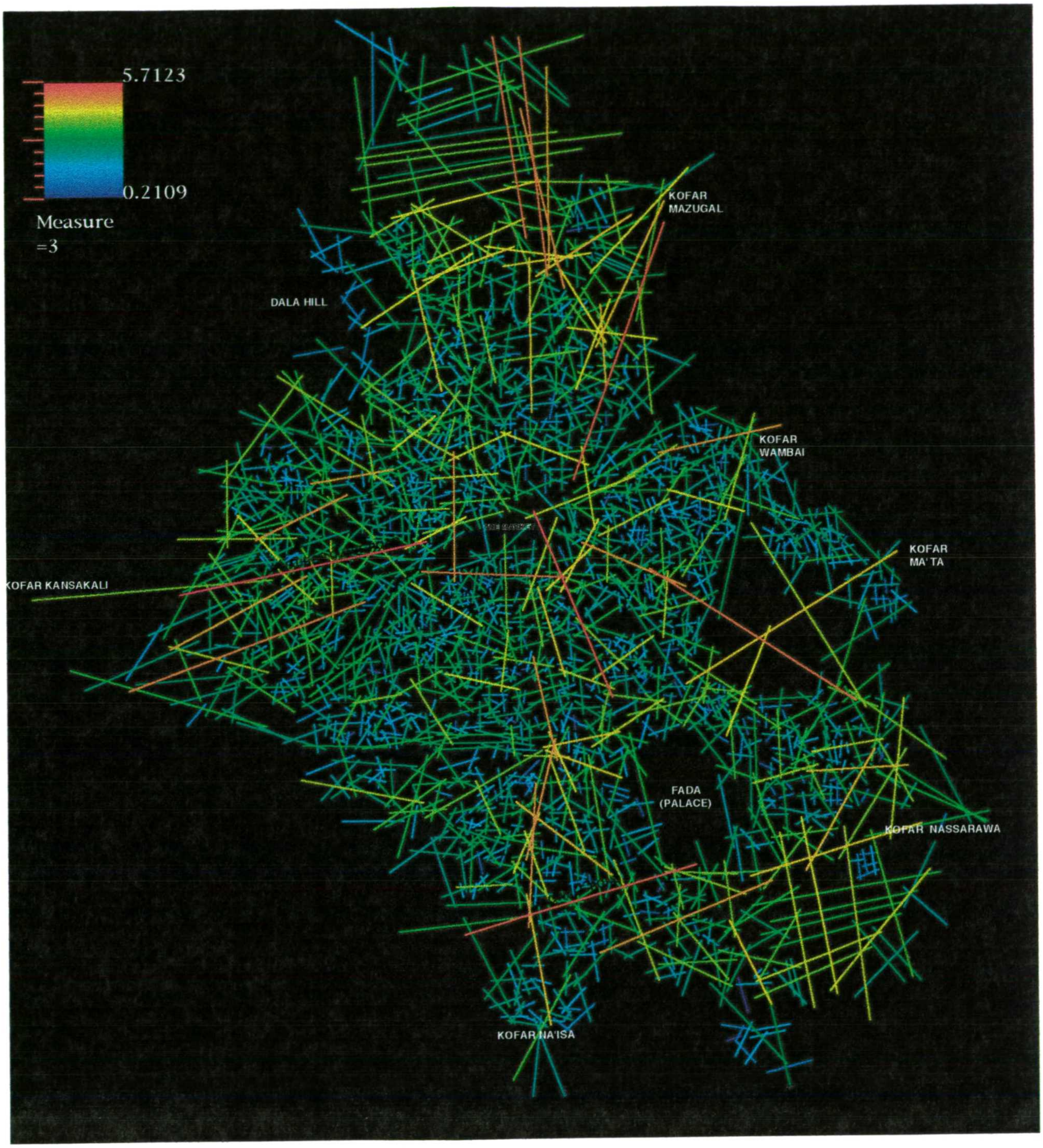

FIGURE A.1-6 : KANO 1963 LOCAL INTEGRATION (R3)

3.2 Spatial Configuration Of Post-Colonial Kano: 1963

Figure A1-5 is the spatial configuration of the walled city of Kano in 1963[19]. Close scrutiny shows its global structure to be not much different from that of the colonial city.This is the only major syntactic difference between the Kano of 1932 and that of 1963. Similarly, the local structure, **Figure A1-6**, does not differ much from that of 1932. The integration core is centred around the market, and the 'second core' is very much similar to that of 1932, some 30 years earlier. Scattergrams for the period (**Figure A1-7**), do not show any marked difference from those of the earlier period. The syntactic size of the city however is slightly larger with 2079 axial lines.

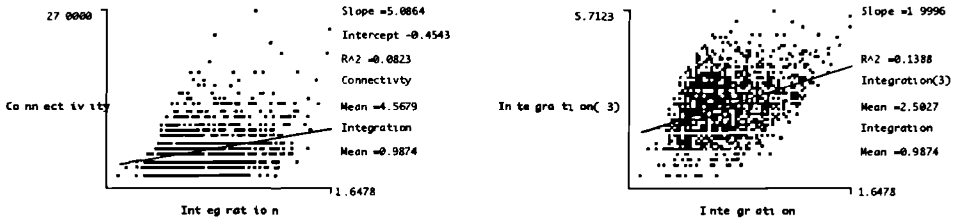

Figure A1-7: Kano 1963 Conscat / Rad-3Scat

Table A-1 sets out the syntactic parameters of the walled city in the two periods. From this it is noted that mean global and local integration values, connectivity and intelligibility, did not change appreciably. Thus the spatial expansion to the north and south west, that the city underwent in the period in question did not in anyway affect its structure or its social logic.

TABLE A-1: SYNTACTIC PARAMETERS (1932 /1963) COMPARISON

City Period	Axial Lines	Rad n Integration			Rad-3 Integration			Connectivity			Depth			Con./Rn	R3/Rn	Rad-R / Rn
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean			
1932	2026	0.56	1.65	0.99	0.21	5.71	2.50	1	27	4.57	1	15	7.09	0.082	0.139	0.453
1963	2079	0.56	1.63	0.98	0.21	5.71	2.51	1	27	4.60	1	15	7.16	0.077	0.136	0.426
% Incr.	2.62		-1.23	1.02	-		0.40	-	-	0.66	-	-	0.99	-6.44	-2.02	-5.94

3.3 Spatial Configuration Of Contemporary Kano: 1990

Between 1980 and 1985 the walled city of Kano was so to speak opened up, that is, two new motorways were constructed. The first bisected the city where it is most compact, roughly east to west, while the second traversed the city where it is most sparse, roughly north to south. At the same time the syntactic growth of the city was almost three times the 1932 -1963 rate.[20] **Figure A1-8** is the 1990[21] global integration pattern of the city. The effect of these changes is to strengthen the core southwards while still retaining its structure. That is the market is still the focal point of the core, but the new motorways draw on the integration core to become well

[19] The map used is Kano 1:12,500; Northern Nigerian Surveys Kaduna (1963 Ed.)

[20] Between 1963 and 1990 the city grew by 147 to 2226 axial lines, compared to 53 axial lines between 1932 and 1963.

[21] The map used is Kano (1990) Scale 1: 12500. First Ed. Federal Ministry of Survey Lagos.

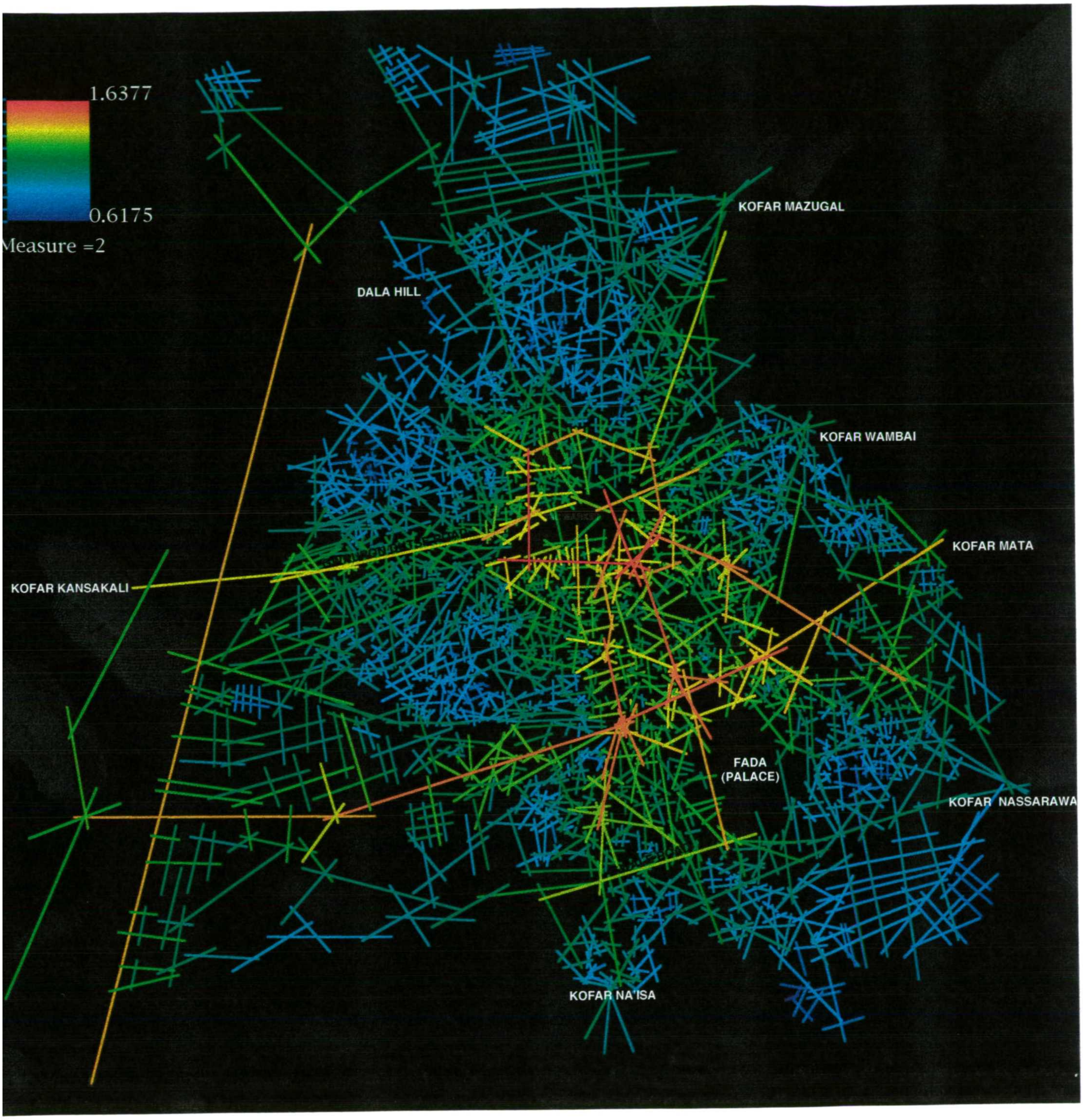

FIGURE A.1-8 : KANO 1990 GLOBAL INTEGRATION (Rn)

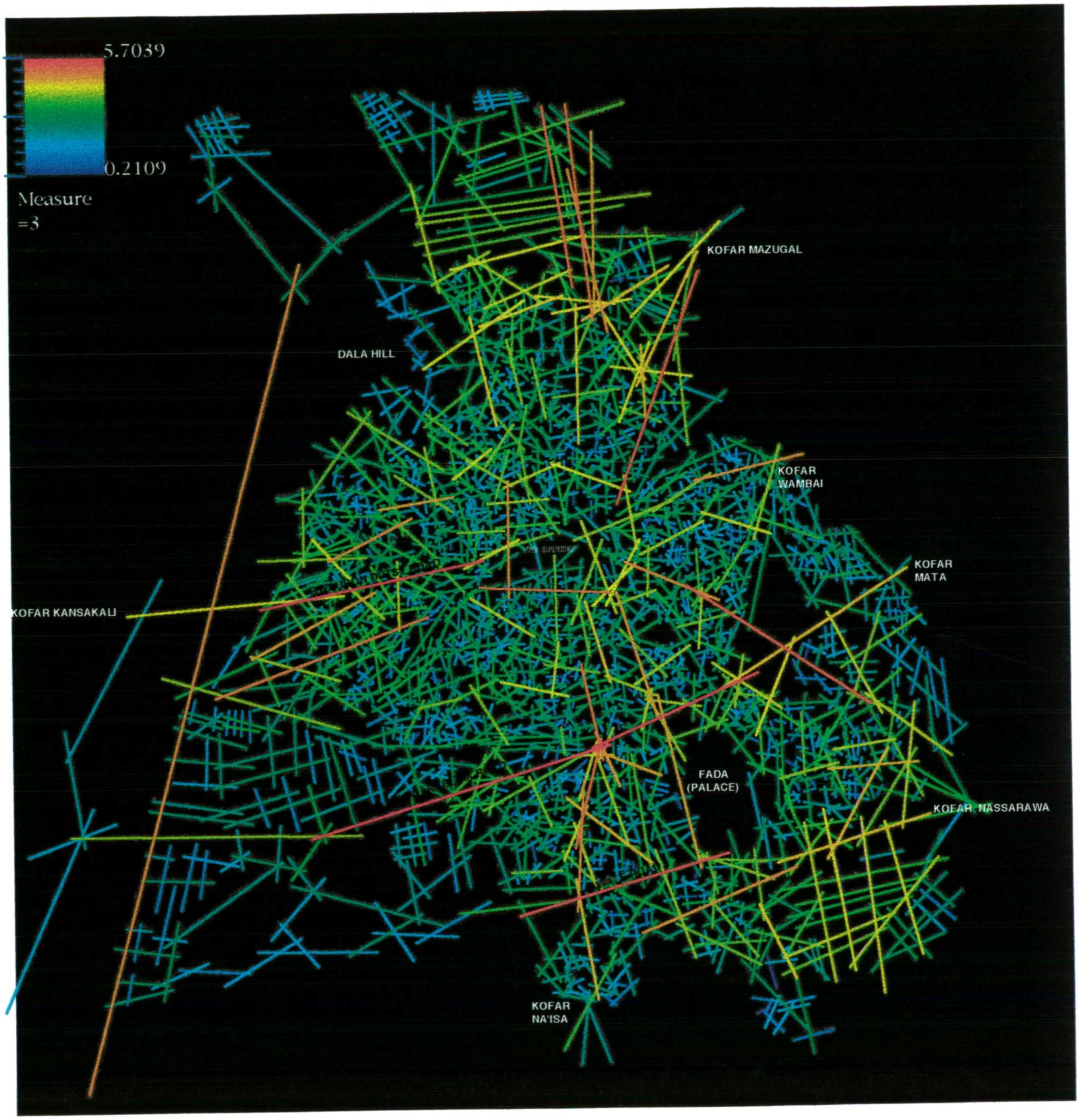

FIGURE A.1-9 : KANO 1990 LOCAL INTEGRATION (R3) integrated. However, the 'second core' does not differ much from that observed in the earlier periods.

Local integration pattern is however, diametrically different from that of the earlier periods (**Figure A1-9**). The main core now shifts almost completely southwards. Although Gwauron Dutse road to the north, is locally the most integrated route, the new motorway that bisects the city now forms a sort of continuous local 'spine'. These two roads plus Gwale road to the south, curiously form three parallel streets east to west, across half the city. It seems the effect of the new east - west motorway is felt more at the local level, rather than at the global level. This observation is borne out by the Scattergrams for the period (**Figure A1-10**). The ConScat and the Rad-3Scat have regression values (R^2) of **0.1252** and **0.2118** respectively, indicating a more marked difference at the local level over the global level.

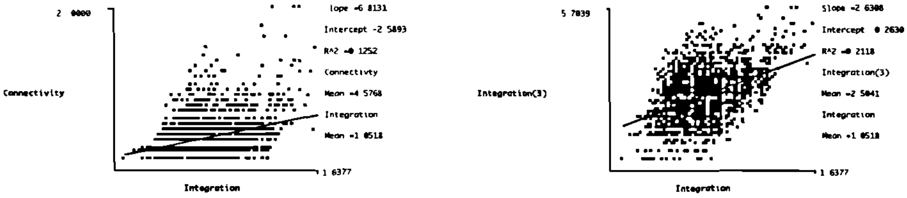

Figure A1-10: Kano 1992 ConScat /Rad-3Scat

6. Kano Spatial Pattern And Structure

In concept, the urban structure of Kano has three main characteristics. First, the syntactic centre coincides with the geographic centre of the city. This by itself might mean nothing except that for Kano, this is where the main provincial and regional market is situated. Second, the market is traditionally the economic and to a large extent, the social focus of the city. This market does not serve as some kind of a large, wholesale clearance and forwarding warehouse only, it had and still has, micro-economic significance, which every family within reach, could identify with (Greenhill et. al. op. cit. : 25). This is what may account for the seemingly 'second core'. Third, the syntactic core is 'shallow' from without, but relatively 'deep' within. Thus although the market is globally easily accessible, the residential wards are globally segregated. Locally however, the reverse is the case, i.e., the edges of the wards are well integrated, while the homesteads at the centre, are segregated.

This structure, attesting to the commercial nature of the city, persisted from colonial[22] times until the 1980's. Between 1980 and 1990 the city witnessed a hitherto unprecedented change. New residential areas were established in the unsettled land to the west of the city, mainly to cater for

[22] There is strong reason to believe that even in pre-colonial times the structure of the city did not differ much from this because, almost all the changes that were wrought by the colonial administration were more a modification or improvement of the existing conditions rather than a radical departure from what obtained. This is partially due to the colonial planning policy (Frishman op. cit. :119-126), but also due to the fact that most of the objectives of the colonial administration, as regards the city, could be achieved with minimal disruption of the city's urban fabric. For example many of the roads constructed by the colonial administration were simply a widening and tarring of existing thoroughfares (See KPO LAY/ 1-8; Also Frishman op. cit. :109).

retired civil servants. Two new motorways to make the city more accessible to vehicular traffic were constructed. Although these motorways did make the city more motorable, they did not in any significant way change the structure of the traditional core. For the local structure however, the story is slightly different. While it has remained the same, from
colonial - and one can safely assume even from pre-colonial times - to post-colonial times, the structure has altered in contemporary times. The result is that contemporary Kano exhibits what has been termed the town -within - town syndrome, where the global (Rn) syntactic core approximates to the local (R3) syntactic core (Loumi 1988:190).

Thus over a period of more than two generations, the urban structure of the Kano walled city has not undergone any radical change. This fact could not be attributed to economic or political stagnation. In fact the contrary is the case, for Kano's economy remained vibrant throughout colonial times, most especially between the 1920's and 1930's, when groundnut production reached its peak in the region (Hogendorn 1978; Shenton 1981; Albasu 1990). Politically, Kano was the capital of the opposition and the home of every radical politics in the region (Whittaker 1968; Paden 1973; Ibrahim 1990). The colonial policy of concentrating all urban development around, or near the seat of the colonial government, certainly contributed to this state of affairs. However, by far the biggest reason for this was the socio-cultural resilience of the city.

In planning[23] urban Kano certain basic rules were informally set out that are responsible for the structure of the city. The first is the principle of *iyaka*, i.e. limits or boundary . Based on the cosmological concept of the four cardinal points (Nicholas 1965), almost all Hausa settlements have clearly defined natural or artificial boundaries, or both[24]. The extent of *iyaka* depends on the nature of the settlement, urban or rural (Yusuf 1974: 211-212).

This concept of *iyaka* persists even where these bounds are not tangible, as for example, in the contemporary limits of the city wards (See Chapter 3 above.). The second is the principle of *sheka*[25], or fallow space. This is the provision of a substantial open space enclosed within the boundary of every Hausa settlement. The purpose of *sheka* is to provide for the expansion of the settlement,[26]as well as provide adequate enough agricultural and grazing land, to support the community. Where the settlement is walled, as in Kano, the *sheka* is made large enough for the settlement to withstand a long siege (Frishman 1977:32). A delicate balance is maintained between the size of the city, i.e. its population and built-up area, and the size of the *sheka* . Whenever this balance is threatened, i.e., where the ratio of the built up area to the open space is above a certain critical limit, the boundary of the settlement, or in the case of Kano, the wall of the city, is

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23 Not in the modern sense of the word but in the sense of the initial formal restrictions. As rightly pointed out by Martin there are no wholly 'organic' or completely 'planned' cities; "both are built up ultimately from a range of fairly simple formal situations ...(which are)... the controlling factor of the way we build...artificial.... or organic..." (1972 :9 -10). Similarly, Scargill (1979:12) writes," the physical expansion of a city is rarely haphazard. *Even when it is not planned..*" { emphasis not in the original }. Urquhart (1977) used the word 'planning' in this sense while describing the landscapes of Northern Nigeria.

24 In most cases these boundaries are real; an inselberg; a river; a baobab tree or a wall.

25 This principle is applied to all collective social spaces. At the house, compound or homestead level this limiting space is known as *haraba* or *farfajiya* , while at the settlement level this space is known as *sheka* or *fako.*

26 This is why it is an accepted principle, that in Hausa urban communities, residential use of land takes priority over agricultural use. This is termed "*Gida -ya- kori - Gona* ."

extended. This ratio is approximately 1:2.[27] While within bounds the extent of the growth of the Hausa city is limited, the pattern of growth depends upon the city's socio-cultural hub; i.e. that part of the city which is the focus of its everyday life[28]. In Kano this had been from earliest time, the market.

Because of the terrain, Kano city could not spatially expand eastwards, and only up to a limit northwards. To the west and south, no such restrictions existed and consequently all its expansions were in those directions. In the history of the city three such expansions have been identified (Hallam 1964; Moody 1967; Barkindo 1983). What is fascinating about these spatial expansions is that, they were carried out such that the syntactic, though not necessarily the geographic, centrality of *Kurmi* market is invariably maintained. The demographic distribution of the walled city has also followed a similar pattern.[29]

While at the global level the structure of the city is regional, at the local or community level, the structure is such that the sub-areas[30] are demarcated peripherally, and manifestly distinct.This strongly suggests that the growth of the city was more the result of accretion of the sub-areas. Further at the neighbourhood or face-to-face level, the homesteads are secluded but not isolated since in most cases it takes no more than three axial steps to connect to a local integrator. The simile that aptly catches this relationship is that of a series of concentric circles (Muhammad-Oumar 1979); the unit noas within the nieghbourhood paranoas; the nieghbourhood noas within the district paranoas; and so on to the level of the urban conglomerate.The overall result is that the city, physically takes a semi-lattice form (Alexander 1972), whereas socially it might exhibit a tree form ; the tree branch connects to the leaf stem which in turn links with the leaf, the individual being the leaf.

4 Summary And Conclusion

The walled city of Kano has a well articulated structure that is centred around *Kasuwar Kurmi*, the main market. The essential elements of this structure are, the syntactic 'shallowness' of the city core and, the relative 'depth' of those residential areas, not primarily linked industrially or commercially with the market. Thus Kano is primarily a commercial town rather than a political or religious town. However, Kano's structure indicates a powerful connection between the mainly commercial and the politico-religious centres. This regional structure has more or less remained globally, or city-wide the same, through colonial and post-colonial times. This city-wide urban resilience, could be attributed to certain socio-culturally derived rules, that control its physical

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[27] Frishman (op. cit. : 210) has estimated that through the ages, the ratio of the built up to the open area is approximately, 1: 3. However Richard Lander's 1826 estimate, on which he based his assumption, puts the ratio as 1:2, which early colonial maps of Kano tend to support . However in smaller towns and rural settlements this ratio ranges between 1:2 and 1:3 approximately (Urquhart op. cit.; Moretimore 1972).

[28] The growth of an 'organic' settlement could be likened to the growth chemical of a crystal in a laboratory; a piece of the substance to be crystallised in suspended in an appropriate solution, and the final size and shape of the crystal, depends upon the concentration of the solution, temperature and the duration of the suspension. This perhaps more than anything, explains the so called ' Islamic characteristics' of many organic cities.

[29] A regression of the population density of the city wards, with the distance of the centre of every ward from Kasuwar Kurmi, shows that until the 1970's, on average the closer a ward is to the market, the higher the density (Frishman op. cit. :142-143)

[30] It should be noted that these sub-areas do not necessarily coincide with the boundaries of the individual wards but in most cases do coincide with groups of wards.

growth pattern . The growth of the city and the recent construction of the transverse motorways did not alter its global structure in any significant way.

Its local structure has also remained the same, from colonial to the end of colonial times. Its essential features are, the distinctiveness of the sub-areas[31], and the seclusion of the homesteads. However, this has been slightly altered in contemporary times, due to the two motorways that traverse the city. The effect of this change is to make the urban fabric universally globalised, i.e., the local structure resembles the global structure in its essential form. The sub-areas seem to lose their distinctiveness, but the homesteads remain largely secluded.

Thus, unlike the case of many of the 'Third World' towns and cities that were 'opened up' by arterial roads, the Kano urban fabric, has actually benefited from this ' opening up'. This however, is not because the motorways were carefully designed to achieve this aim, but mainly because they happen to coincide with the city's socio-cultural urban pattern whose logic, has allowed Kano to maintained its structure at least over the last couple of centuries or so.

[31] Some of the sub-areas coincide with the city wards demarcation.These tend to stand alone and be more inward looking. Others are much more connected to their surrounding areas and tend to be more outwad looking. Generally the closer a ward is to the syntactic centre, i.e. , the market, the more it is likely to be syntactically indistinguishable and part of a sub-area.

APPENDIX TWO

SELECTION OF WARDS

Listed hereunder is the list of the wards selected. The brief description given for each wards is the basis for selection. The wards in bold are associated with a trade or profession while those written in plain are associated with a clan, tribe or ethnic group. The letter stands for the sector (North , South, West or East) to which the ward belongs, while the number in bracket identifies the ward on the map (**Figure 3.7**).

1. **Adakawa** (N 1)

This ward has always been associated with crafts. Tradition records the name of the person who established it as Abubakar , a blacksmith who specialised in making *munduwa*, a kind of jewellery worn by women (Frishman op. cit.). As the name suggests it was originally identified with chest makers from the Hausa word *adaka* for chest, box or simply container. In addition leather works and tanning are also practised. At the turn of the century it had the largest number of tanning centres (Isma'ila 1984:33-38). Sadly it is now without a single tannery. It still has the famous women's market, although it has shrunk considerably and has reverted to being a day market rather than a night market as it was originally.

2. Alfindiki (S 5)

The name of this ward was derived from the Arabic word *al-funduq* meaning inn or guest house . According to oral tradition an inn was established early 1800's in the area, by the North African community possibly to cater for the seasonal traders from North Africa. This would perhaps be because the wards traditionally associated with the Arabs { Dandalin Turawa and Tudun Makera } were getting over populated or a new group of Arabs were making their appearance in Kano. In fact there is reason to believe both reasons apply. [1]

Thus Alfindiki was established to accommodate the new influx of Arab traders early in the 19th century. It also served as a place for the local Arabs to send their servants to be trained in North African cuisine (Adamu 1968:44)./

3. Baƙin Ruwa(W 10)

The inhabitants of this ward are mainly the descendants of the Abagayawa. Since these were among the first people to be identified with Kano , this is probably one of the oldest area to be settled in the city. It was named (Hausa: black water) after the murky part of Jakara river that borders it. Being in what was perhaps an early slum area of the city, and its proximity to the first Kano sheka suggest that it might have been associated with farming. Indeed Staudinger, the German explorer who visited Kano in 1885 and entered the city from a Southwest gate had to go through a large expanse of cultivated land before reaching the first residence (Moody 1968 : 40). If we assume this gate to be Kofar Gadan Kaya - and most probably it is - it would mean

[1] Interview with Alhaji Garba Adamu Na Ma'aji 19/7/94 who pointed out that the Arabs who settled in Alfindiki were mainly from the Maghreg - modern Tunisia and Morocco, rather than from modern Libya.

the land adjacent to the ward. During the colonial era it became famous for it's association with the radical Tijjaniyya tariqa (Paden 1973: 19 &389-404).

4. Bakin Zuwo (E 10)

The name of the ward means adjacent to or in front of, the nettle tree (*celtis integri folia*). The area was first occupied by a people called Kudurawa, who migrated from the ' far south', perhaps from the forest zone (Frishman *c.* 1975). By the beginning of the early 17 th. century these were replaced by Arabs and Kanuri settlers . The Arabs were mainly tailors and embroiders while the Kanuri were traders in salt and acted as *fatoma* or guest-inn keepers (Perchonock op.cit.:). Its proximity to Kurmi market makes it the home of many brokers and petty traders, but the chief occupation used to be tailoring and dress making. There are still many tailors to be found today.

5. **Ceďiya** (N12)

This ward is named after the fig tree (*Ficus Thonningii*) common in and around Kano. It's differentiated from other wards of similar name by the tag *gurasa*, Hausa word for bread for which it is famous. It's adjacent to both Dandali and Tudun Makera and at one time all three were known by the name of *Kulƙul* . This we are told (Adamu 1968: 44) was the name of the Tripolitanian Arab named Abdullah Kutkut who was the first to establish the ward in the time of Sarki Ibrahim Dabo (1819 -1846) . It was the headquarters of Goron Duma, one of the ten Kano zones at the turn of the century (See Chapter Three above). Most of the women[2] in this ward are engaged in the still profitable business of *gurasa*, producing the bulk of the *gurasa* consumed in Kano City and its surrounding villages.

6. Dala (N 8)

Dala is the name of one of the ancestors of the Abagayawa the original indigenes of the area now known as Kano (Palmer 1928 :97). It is one of the earliest , if not the earliest places to be settled in Kano. It's been associated with iron smelting and smithing. (Dokaji 1958:13-16). The home of the Tsunburbura shrine, the fenced tree called *kaguwa*, was located not far from the foot of the Dala hill (Palmer 1928 :98) until it was destroyed by Sarki Tsamiya (1307 - 1343). Dr. Barth who was quartered in the ward when he visited Kano in 1851, found it to be a prime area (Barth 1857:) .

7. Danbazau (E 19)

This is a Fulani ward established, according to oral tradition, by a Mallam Inusa Dabo Danbazau, hence the name. Danbazau migrated to Kano from Gombe shortly before the jihad of Usman Dan Fodio (c. 1804). He was one of the several Fulani scholars who were mandated by Usman Dan Fodio to execute the Jihad in Kano. A true scholar who earned his living by making ropes, he declined political office and lived a simple life. However his son became an important official, the Sarkin Bai and one of the Kano king-makers. (Perchonock 1976: 7). Most of the people of the ward belong to the Danbazawa clan and rope making was

[2]According to (an unsubstantiated statement made by) Hajia Hauwa Feda (Interview 04 July 1994) there are more women with regular income than men in this ward. Even if not factual , this statement, is at least representative of the female perception in the ward.

until recently, still practised in the ward. Nowadays the dominant occupation in the ward is trading.

8. Dandali (N 21) or Dandalin Turawa

As the name indicates (The Square or The Arab Square) this ward was established by the Arabs from North Africa (see Cediya above) notably western Tripolitania (Ghadames) and Fezzan (Murzuq). It was identified with wholesale trade of imports and exports. It received many immigrants and grew in wealth and fame in the 15th. century when Kano eclipsed Katsina as the southern terminus of the trans-Saharan trade. During the Kano Civil War (1893 -1896) it was the only rich ward to clandestinely support Yusufu over the Sokoto imposed Tukur (Adamu 1968; Fika 1972). During WW II when Germany occupied France in 1940, many Arabs residing in the French territories across West Africa, especially the territory of Niger, migrated to Kano and settled in Dandali[3]. The current *Maiunguwa*, Alhaji Ali Abba in whom could be seen some of the Arab features, is a descendant of one of the Ghadames Arabs.

9. **Darma** (E 23)

This was the headquarters of one of the ten 19th. century Kano zones and ranked third in order seniority, after Madabo and Goron Duma . Tradition has it that the first to settle in the area was some saint by the name of Ahmadu Gwarkin Darma (Frishman c 1975). It was initially a blacksmithing ward as the name *darma* (Hausa : lead) indicates. Some of the blacksmiths of Kano trace their roots to this ward, for instance, the smiths of Kofar Wambai ward claim that their ancestor first settled in Darma before moving to their present location due to lack of space for expansion (Musa 1981:26-27). However by the turn of the century there was virtually no trace of this craft in the ward. In pre-colonial times Darma became famous in the second half of this century as the home of some the wealthiest merchants in Kano, second only to Koki ward. However while Koki was usually associated with Kolanut trade, Darma was associated with Cattle, and hides and skin trade.

10. **Diso** (W 26)

The name probably belongs to one of the earliest settlers of the ward. It is closely associated with Galadanci which is the home of the *Galadima*, an important official and one of the Kano king makers. At the turn of the century it was one of the 15 wards associated with blacksmithing. In fact for the best part of this century the Sarkin Maƙera, the head of the blacksmiths guild, has come from the ward (Jaggar 1973:13-18). Although blacksmiths from the ward claim Kanuri to be their ethnic origin, there is reason to believe that this ward started as a settlement for the slaves and clients of the family of the Galadima[4].

11. **Dukurawa** (N31)

This ward is bordered by Dala, Cediya, Masukwani and ... According Musa (1981:17-18)., this ward was established during the Fulani era by Mallam Muhammadu Maƙeri who migrated from the Northeast in the reign of the first Fulani King Sulaimanu (1805-1819). Mallam Muhammadu

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[3]Field Interview with Alhaji Ibrahim Muhammadu , the deputy MaiUnguwa of Dandali 11 July 1994.

[4] Interview with the *MaiUnguwa* Alhaji Namadi Abdullahi 29 June 1994

Maƙeri practised his trade in many towns like Wadai, Agades, Gumel before finally settling down in Kano. Another tradition recorded by Frishman (c 1975), has the ward established by a man from Dukurawa ward in Katsina. However there was most probably an older settlement, perhaps belonging, as the name indicates, to the Dakarkari or Dakkarawa tribe from the Northwest and hence the name of the ward. In fact the Kano chronicle mentioned that one of the deposed Habe Kings, Soyaki Son Of Shekarau, was resettled in this ward in 1652 (Palmer 1928:120).

12. Durumin Arbabi (E 32)

The first to settle in the area was a silver smith called Sambarta, a Tuareg from Agades who came at the invitation of King Abdullahi Maje Karofi (1855-1883). However the name of the ward is attributed to a certain scholar by the name of Muhammadu Dukusuru, a native of Daura. This scholar used study under a durumi tree and write a four versed poetry, termed *arbab* in the Arabic (Frishman op. cit.).

This ward however has been the home of many immigrants, perhaps because of its proximity to the great market, hence most of the inhabitants have either been traders or associated with trading. These include long distance trading, kolanut wholesale, and lodging of traders. (Perchonock 1976:8)

13. Gabari (E 36)

One of the oldest Kano wards whose earliest settlers were Kutumbawa - an old Hausa tribe. These were later joined by Nupe immigrants (Frishman op. cit.) during the reign of the last Habe king, King Alwali (1781 -1807), and Kanuri immigrants from Borno (Perchonock 1976:6). The name of the ward derives from the gabaruwa trees that were found in the area. The main occupations of the earliest settlers were silver smithing and iron smelting. At the turn of the century however, cloth weaving and long distance trade in kolanut became the dominant occupations in the ward.

14. Jingau (W 50)

Another of the ten 19th. century zonal headquarters of Kano city. The name was probably derived from the Hausa word *jinga* meaning contract. Little of it history is known but it has been associated with leather works and with brokerage (Musa 1981:6). It received many immigrants in the aftermath of the shift of the trans-Saharan trade from Katsina to Kano in the 15th. century (Paden 1973;151). Jingau is famous for the Halla-halla mosque, perhaps the first tariqa mosque in Kano that was established in the reign of King Alu Maisango (1894-1903).

15. **Koƙi** (E 71)

In Hausa fairy tales, Koƙi is the name of the formidable wife of *gizo* , the smart-aleck hero of these tales. Tradition has it that the ward was named after a certain fascinating elderly lady who in many ways resembles Koƙi, and hence the name. She is said to have instituted a market and by sheer will-power persuaded many itinerant merchants to patronise her market. The market grew in steadily until it became in important enough to be visited by the Sarki during one of his annual visits[5]. There was no official to receive the Sarki, and Koƙi against all tradition, turned up fully bedecked and received the Sarki. She so impressed the Sarki that she was made the first female MaiUnguwa, against all tradition[6]. This was most probably King Usman Ibn Dabo (1846 -1855) or his brother Abdullahi Maje Karofi (1855-1882) . Its location close to the Kurmi market and the two gates of Jakara and Mazugal may have greatly facilitated its growth. In this century Koƙi is famous for two things; kolanut trade and the number of its merchants, some of whom were, and still are the richest in Hausaland (Lovejoy 1980).

16. **Kwarin Mabuga** (E 77)

This ward has always been associated with craftsmanship as its name (valley of {cloth } beaters) indicates. The area was initially colonised by the Kwararrafawa who used it as a work place. However the first to be identified with it were pagan Hausa, the Kutumbawa, who were mainly blacksmiths. This was probably during the reign of King Sharefa (1703-1731). During the reign of King Abdullahi Maje Karofi (1855-1882) a Fulani clan from the north-east settled there at his invitation.

The proximity of the ward to the great market has encouraged the people of the ward to trade especially in the famous Kano cloth (Perchonock 1976:7).It appeared to have had the largest number of blacksmiths, and some of the most prosperous in Kano at the turn of the century (Jaggar 1973:14). In the First Republic's derive to encourage indigenous industry, Kwarin Mabuga smiths were singled out as some of those to receive government in-service technical training and special soft loan (Darma 1992) . Unfortunately the First Republic did not last long enough to see the scheme to its logical conclusion.

17. **Lokon Maƙera** (W 80)

The ward's name means smiths' alley and it's one of the 15 wards identified with smithing in Kano although the craft is no more practised in the ward. A smith from this ward used to be appointed the secretary of the Kano smiths guild. Its origin is obscure but it was most probably Hausa in origin (Jaggar 1973:13).

18. Madabo (N 81)

This is one of the oldest wards in Kano and the seat of government until the 15th. century when King Muhammadu Rumfa (1463 - 1499) built the present palace and moved the seat of government (Dokaji 1958:20). Subsequently it became the ranking zone of the ten Kano zones in pre-colonial times. With the firm establishment of Islam as the state religion at the beginning of the 14th. century, the main Friday mosque was built on or near the location of the *kaguwa* tree (Paden 1973:48). However by the time of Sarki Rumfa , this mosque was beginning to be more and more identified with the traditional religion rather than with Islam. This prompted Sarki

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[5]It was the tradition of the Sarkin Kano, once a year, to officially go round all the wards in the city and its periphery. The MaiUnguwa and his people used to turn out in their 'best' to receive the Sarki and his entourage.

[6]In most parts of Hausaland women were given mainly titular offices rather than executive offices. The exception were for jobs that only women, by virtue of their sex could do, for instance the post of *Jakadiya*, *Magajiya* and *Zabiya*, the king's palace messenger, the head courtesan and the female lead singer respectively. However in some Hausa states, notably Zaria ,Daura and Damagaram (Zinder), women were given fiefs to administer and could, theoretically at least, even get to become the executive queen.

Rumfa to relocate the mosque to Nassarawa gate and raze the *kaguwa* area once more (Zahraddeen 1983: 58 - 59).

Perhaps it was this strong association of the *kaguwa* area with un-Islamic pracises which made Sarki Rumfa move the seat of government to an entire virgin land south of the then city limits. Even then Madabo, as the home of the Babban Malami, the official head of the Kano mallams, continued to be the focus of Kano spritual activities. and it is reputed to have had the first mosque in the city .

19. Mallam Ganari (E 91)

The establishment of this ward is attributed to Mallam Muhammadu Maiganari, a Kanuri from Kukawa. As the prefix mallam suggests, Muhammadu Maiganari was a scholar who was later turned by circumstances into a merchant. It was reported that Mallam Maiganari came to Kano to study, loved the climate and the cosmopolitan nature of the city and decided to stay. However since he was neither ready to accept official patronage nor to be involved with *tsibbu* (spritual healing), after a year in Kano he became broke and was forced travel back to his roots in Kukawa for reinforcements. When he came back a year later he brought some items that he would resell and pay the debts he incurred in Kano. To his joy and surprise, he found he could repay his debts and still have enough to support himself for another year. This is how the mallam got to travel annually to Bornuland to take Hausa merchandise and bring back other Bornu merchandise[7]. He would live off the profits while he studied, until the next year. His descendants continued with this tradition, but as time went on they concentrated more and more on the trade, though to a lesser extent they still tried to maintain the tradition of scholarship.

Mallam Ganari, together with the adjacent Daganda ward, are perhaps two of the smallest wards in the city[8]. It is also the only ward in the city to fully retain its ethnic composition and characteristics. Its location within the city and its compact size suggests, that it was created out of an older ward not unassociated with trading.

20. Sani-Mai-Nagge A (W107)

This ward is named after the person who made the area famous, a certain Mallam Sani -the cattle- owner. It is one of the largest and the newest wards having grown in the 1970's, the time of the oil boom. Prior to that the area was designated part as a hurumi, an expansive cemetry, and part as burrow pit area. Some of the richest lateretic soil good for building was excavated from this area. All the same the area was not devoid of inhabitants; indeed there were scattered households.

In the aftermath of the oil boom there arose an acute need for residential land in and around the city of Kano. Many indigenes of Kano who could not reconcile themselves to living in Waje area started to reclaim burrow pits and parts of old cemeteries to build on . Also in 1979, the state government demarcated some plots and allocated them to middle level civil servants, most

[7]This tradition was related to me, 14 July 1994, by Hajia Fastuma MaiGanari, a 70 year old direct descendant of Mallam Ganari who assured me that as a child she used to travel annually to Kukawa with her parents.

[8]According to the 1994 records of the office of *Wakilin Gabas* (**Appendix 6**) Mallam Ganari and Daganda wards had only 39 and 37 houses respectively, none of which was a splinter house.

of whom did not have the wherewithal to build, and hence sold their plots. In 1985 the ward was split into two parts "A" and "B" in order to facilitate its administration. Not unexpectedly this split the ward socially. While the "A" part is dominated by the low and mid-income groups the "B" part is dominated by the nouveaux -riche.

21. Sharifai (E112)

This ward was established by the famous North African itinerant scholar Shiekh Abdulkarim Muhammad Al-Maghili better known in Kano as Sharifi, hence the name Sharifai or the residence of the *shareef*, an Arabic word meaning honourable one. Sheikh Maghili visited Kano during the reign of King Muhammadu Rumfa (1464-1499) and stayed in Kano long enough to establish a scholarly community centred around a mosque which he built. Al-Maghili left three of his sons who subsequently generated the Sharifai clan. In time the ward became, like Madabo ward, a venerated religious centre in ancient Kano (Sa'ad 1989:63). However unlike Madabo which was politico-religious, Sharifai was more the socio-religious centre of learning, even though the head of the ward had been one of the king's advisors from the 15th. century until the advent of colonialism. This is attested to by the fact that during the Kano Civil War (1892 -1896), Sharifai ward was the only area in Kano that was considered neutral ground by both parties to the conflict. The ward is also renowned for its good leather works.

22. Sheshe (S 114)

This was the limit of Kano walled city up to the mid of 15th. century, and one of the ten zonal headquarters in Kano at the turn of the century. The name ***sheshe*** appears in the Kano chronicle (Palmer 1928:104) as one of the Wangara leaders who migrated to Kano from Melle or Mali in the west in the time of King Yaji (1349- 1385). It's interesting to note that five out of the recorded fourteen Wangara leaders had wards named after them. However the name also appears in the *Song of Bagauda*, a homily of kings of unknown origin (Hiskett 1964 /65). In verses 41-42, Sheshe was mentioned as one of the names of the pagan Hausa leaders of Kano, the others being Gwale and Yakasai. Either explanation accepted would make the ward very old.

23. Soron Ɗinki (S 116)

Situated north of *Gidan Rumfa* the palace built by Muhammadu Rumfa (1463-1499), this ward has always been associated with the palace. Its establishment is attributed to one Bello Dan Kwaido who came to Kano from Bichi district (Frishman op. cit.). Its inhabitants have either been traditional tailors or palace courtiers (Usman 1990:20), but as the name (Sewing hall) suggests it has always been identified with sewing. A recent study (Yahaya 1992:30-31) shows that most of the inhabitants of the ward are still in one way or another, associated with the palace.

24. Ƭudun Maƙera (N 119)

This is one of the 15 wards identified with smithing in Kano city whose blacksmiths were famous for locks (Jaggar 1973:11). It was associated with Tripolitanian Arabs and other North African immigrants, (see Cediya above) who are reported to have started silver smithing there (

Frishman op. cit.). The present *MaiUnguwa* (Ward Head), Mallam Uba Jibrin claims he is a direct descendant of a Fezzani Arab, even though he has none of the characteristic Arab features.

25. Tudun Nufawa (E 120)

As the name (Nupe hill) indicates the earliest settlers were craftsmen from Bida ,the capital of Nupeland. According to Perchonock (1976:5), these Nupe settlers came to Kano during the reign of the first Fulani King Sulaimanu (1805-1819). However another tradition collected by Frishman (c 1975), has it that many Nupe from the ward left Kano at the time of the Dan Fodio Jihad, for fear of conversion into Islam. If this is correct then the ward is certainly predates the Jihad.

These Nupe people were primarily weavers but many of them also engaged in *koli*, or petty trading. Later other people from other parts of Hausaland settled in the ward and expanded the size of the ward to it is now. Many of the inhabitants of the ward at one time, owned large farms.

The location of the ward is interesting. There is reason to believe that the area to the west of the Kurmi market was at one time, most probably a sort of slum area (Paden 1973:357). This was due to the fact that River Jakara drains westwards carrying with it all the tannery sluices from up stream. This would have made the area inhabited mainly by poor artisans, many of whom would be immigrants. Hence it is not surprising to find wards like Takalmawa, Ayagi and Tudun Nufawa etc., forming a continuos cluster in the area south-west of the market. However the descendants of these immigrants have been fully assimilated into the Kano milieu, and only the name remains.

In the 1960's Tudun Nufawa ward was one of few wards in the city to be associated with the radical politics.

Unguwar Gini (S 124)

Unguwar Gini is part of the area to the south of the palace that remained uninhabited from the time of Rumfa until the time of King Ibrahim Dabo (1819 - 1846). Tradition has it (Darma c.1992) that some of the sons of King Dabo became delinquents and were embarrassing the King. One of his advisors suggested that the King should build a residential estate for all his sons near the palace where he, Dabo, could keep a close eye on them. This he did and the area to the south of the palace came to be known as Unguwar 'Yan Dabo, which was subsequently shortened to Indabawa. It was out of this area that four wards arose; Indabawa, Unguwar Gini, Kurmawa and Wudilawa.

However another tradition[9] holds that Unguwar Gini, started as a camp for the royal builders long before the commission to build the estate for Dabo's children. This ward as the name shows, (builders ward), has always been associated with the palace. It was, and to a large extent still is primarily inhabited by palace builders or their descendants.

27. Warure (W124)

---

[9]Interview with Alhaji Maikudi Mai Gini 22 June 1994.

The earliest settlers were blacksmiths from Katsina to the north, who claim to be Fulani and the name of the ward is most probably from the Fulani. In fact it is said that the sons of the first Fulani ruler, Emir Sulaiman Ibn Adhama (1807 - 1819) retired to the area to farm at the behest of their father (Frishman op. cit.).

It is one of the 15 wards associated with blacksmithing and the deputy head of the Kano blacksmith's guild usually comes from the ward (Jaggar 1973:13-18). It is also associated with hunters. In fact until the early 1970's the ward used to be the base from which the Kano annual amateur hunting expedition starts. However the ward is most known for its 'Yan Tauri cult and the sensational headlines they make in their gang wars (Dan'asabe 1991).

28. Yakasai A (S 126)

This name is also mentioned in *Waƙar Bagauda* (vv 41-42) as one of the three leaders of pre-Islamic Hausa, together with Sheshe and Gwale, who came from the ancient Kingdom of Gaya , East of Kano. If this is correct then the present ward must have been a relocation of an older ward, since the area became part of the city only after the 15th. century expansion of the city wall. At one time Yakasai was the largest ward in the city, in terms of area and population. In 1961 another ward called **Yakasai Sabuwar Unguwa**, was carved out of for ease of administration. during colonial times its location, its association with the *mallam* class, and it ability to absorb immigrants made an area favoured by the mid-level *Native Authority* civil servants .

29. Zango (S 137) or Zangon Kira (Camp or Smithing camp)

Established in the Habe era, this ward was originally a Berber/Tuareg settlement that was outside the city limits. The early settlers specialised in white-smithing i.e.. they dealt with gold, silver copper etc. It was incorporated into the city of Kano when the first wall was constructed(12-14th Century), although unlike Fagge, it had always been considered as part of the city of Kano. Zango was one of the ten pre-colonial administrative zones.

Interestingly Zango had from its establishment always been administered by the representative of the King of Agades, until the Fulani Jihad. The administrator of Zango, designated Manzo (Hausa: ambassador), used to attend the King's court until the Fulani Jihad (Musa 1981: 12-13).

30. Zangon Bare-bari (E 138)

This ward was founded by one Mallam Muhammadu , a Kanembu, and his followers hence the name of the ward (Kanuri camp).They came to Kano during the reign of the second Fulani king Ibrahim Dabo (1819-1846). Mallam Muhammadu was a Qur'anic scholar but the proximity of the ward to the great market coupled with the fact that Islamic scholars usually practised a trade made the ward inclined towards *fatoma*, guest keeping, and trading. At various times the ward was known for slave trading, salt and potash, lodging of visitors and the now obsolete craft of *awaiki* (Perchonock 1976:6-7).

APPENDIX THREE

Physical Survey

Ward : ....

House No: ....

Date: ....

Time of Visit: ....

Name of Researcher (s): ....

1. Basic Use

a) Residence

Single Family

Multi-Family

b) Work Place

Type of Work...(Specify)

c) Combined..(Specify)

2. Structure

a) Building Material(s)

Mud (Without Finish)

Mud (With Finish)

Mud (With Cement Finish)

Concrete

Other ....(Specify)

b) Roof Type (s)

Thatch

Azara (Flat Roof)

Azara (Arched Roof)

Corrugated Iron Sheet

Concrete

Other ....(Specify)

c) Number of Rooms / Rumfa

1) Ground Floor................./.............

2) Upper 1 ..../...................

3) Upper 2....................../.....................

4) Other ....

d) Type & Number of Toilets

Pit Latrine

WC

Bucket

Other ....(Specify)

3. Specifications

a) Area of Compound.. sq m

b) Open Area...sq m

c) Population...

d) Number of Zaure...

e) Number of Courtyards ....

f) Number of Rumfa..

g) Number of Ɗaki(Rooms)..

h) Average size of Zaure..sq m

j) Average size of Courtyard...sq m

k) Average size of Rumfa..sq m

l) Average size of Ɗaki(Room)...sq m

m) No of Persons per Rumfa...

p) No of Persons per Room...

q) Av. Courtyard area per Person..sq m

r) Av. Rumfa area per Person...sq m

s) Av. Ɗaki(Room)area per Person...sq m

4. General Observations(Light;Ventilation; Waste Disposal etc.)

....

....

....

....

....

....

....

....

APPENDIX FOUR

Questionaire for Maigida or Head of Compound

1. How many men have a trade or occupation in this house (Mutum nawa ke da sana'a ko aiki a gidan nan) ? ....

2.How many of the men have families (Mutum nawa ne magidanta)..........................Others (wanda ba magidanta ba)?................

3. Number of Families

N	Maigida	Trade Sana'a	I*	Tribe Asali	Am	Af	Cm	Cf	Remarks
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

{ I* : Trade/ Occupation Inherited? (Y or N); A(m&f) : Adult Population ; C (m&f) : Children Population (male/female) }

{ Sana'a: Haye ko Gado?}

4. How many are related to you?/ Mutum nawa ne ke da dangantaka da kai?...

a) Father/uncles (Babanni ko Iyaye)..

b) Brothers ('Yan uwa shakikai)...

c) Cousins (Yan uwa rafani ko taubashi)..

d) Distant relations (Dangin nesa)...

e) In laws (Surukai)...

f) Children ('Ya'ya na ciki)...

5. Those not related to you are (Wandanda ba dangi ba kuma)

a) Close friends (Aminai)..

b) Friends (Abokai)..

c) Tenants ('Yan haya)..

d) Others (Wasu kuma)..(specify /ayi bayani)

6. How many of the men in this house also farm beside their trades?(Mutum nawa ke noma bayan wata sana'a?)..............................

7. Have you lived here all your life?/Ana zaune nan tun haihuwa?(Y/ N)..................If No specify

a) --------- Another ward/ Garin nan wata Ungwuwar ....

b) --------- Outside the City/Garin nan amma waje............................

c) ----------Not in Kano/ Wani garin ko kauye..................................

Sauran magidantan fa?(Y/ N)...

d) How did you end up here?/Mene ne sanadin tarewar ka nan? (This House, this ward) Sauran magidantan fa?

1	
2	
3	
4	
5	
6	
7	
8	

8. Compound History/Tarihin Gidan

a) Who established it.(Wa ya kafa gidan nan)?..................................

b) When (Yaushe)?..

c) Who owns it now .(Wa ke mallakin gidan nan)?.........................

d) How and when?(Sanadin mallakar da lokacin da aka samu)

1) -------- Built (Ginawa yayi)

2) -------- Inherited (Gada yayi)

3) ---------Purchased (Saya yayi)

4) ---------Rented/Loaned(Haya ko Jingina)

5) ---------Borrowed/Granted (Aro ko Riko ko Kyauta)

e) Was the house like this when it was constructed(Yaya fasalin gidan nan yake tun farko)............? If no state its growth starting with the earliest part and ending with the latest part (In a'a, wane irin sabon tsari aka yi masa ya zama haka)................................

....

....

f) When were major changes undertaken last (Wane muhimman gyare-gyare aka yi) ?

------------ 20 years or more (Shekara 20 ko fi)

----------- 10 - 20 years

------------ 5- 10 years

-------------Recently('Yan kwanakin nan)

Give details briefly(Yi bayani a takaice)...

....

....

Pipe borne water(Ruwan pampo)..............Electricty (Lantarki)...........

9. How often is this house maitained (Yaya harkar gyaran gidan nan ta ke.? Yaushe ake yi) ?

------------- Regularly/ A kai-a kai

------------- Occasionally/ Lokaci-lokaci

--------------When necessary/ In ya zama tilas ko in da hali

10. How is it maitained (Yaya a ke gyaran gidan nan)?

----------------- Individual effort/ Nafsi-nafsi

---------------- Group effort / Aikin gayya

-----------------Someone designated / An wakilta wani ko wani ya dauki nauyin haka

-----------------Paid labour/ 'Yan kwadago ko lebura

-----------------Other / Wata hanyar dabam (Specify /Yi bayani)...

11. How many men know anything about building or construction in this house (Mutum nawa suka san harkar gini a gidan)
nan)?...

12. Which part of this house do you spend most of your time(A sashen gidan nan ne kafi amfani dashi)?...

....

13.Which part of this house do men spend most of their time (Wana sashen gidan ne maza suka fi dimanta)?..................................

....

...............................(in order of pref/ a fara da inda aka fi so)

14. Which part of this house do women spend most of their time(Wana sashen gidan ne mata suka fi zama)?...............................

....(in order of pref/ a fara da inda aka fi so)

15. Which part of this house do children spend most of their time (Wana sashen gidan ne yara suka fi zama?...
....(in order of pref/ a fara da inda aka fi so)

16. Where do most men recieve their guests (Ina maza suke karɓar baƙinsu)?...

17. Where do most women recieve their guests (Ina mata suke karɓar baƙinsu) ?...
....

18. Where do most men eat (Ina maza suka fi zama cin abinci)?
....

19. Where do men usually sleep? And the women(In ku maza kuka saba barci. Matan gidan fa) ?..
....

20.Where do most women eat (Ina mata suka fi zama cin abinci)?
....

21.Where do most children eat (Ina yara suka fi zama cin abinci)?
....Sleep(Barci fa)?..

22. If there are means what changes would you make in the compound (In da hali wane gyararraki ko sabon salo za ka yi a gidan nan)?

-----------Access to the house/ Kofar gida wajen shigowa

-----------The facade/ Fuskar gidantare da bangonsa

-----------Number of Rooms/ Yawan ɗakuna

-----------Rebuild with different the materials / Sabon gini da sumunti ko dutse

----------Organisation of the house/ Sake fasalin gidan.............

....
....(Give outline/ Yi cikakken bayani)

------------Other./Wani abu daban..
....(Specify/ Yi bayani)

23. What's your relation to your (Me ne dangantakar ka da);

1) Right Neighbour (Makwabcin ka na dama)?.......................
2) Left Neighbour (Makwabcin ka na hagu)? ....

3) Rear Neighbour (s) / Makwabcin ka da ke bayan gidan nan?...

4) Compound (s) Facing/ Makwabcin ka da ke tsallaken hanya ?..

24.Which part of Kano do you think is the best place to live in (Wane wuri ko ungwuwa a garin nan ka ke jin yafi ko ina baka sha a'war ka zauna a ciki)?...

Why (Don me)?...

25. Which part of Kano do you think is the worst place to live in (Wane wuri ko ungwuwa a garin nan ka ke jin ka fi kyamar zama a ciki fiye da ko ina)?...

Why (Don me)?...

....

26. Given the choice in which part of Kano would you prefer to live (In an baka zabi wane bangaren Kano ka fi sha'awar ka zauna?

a) --------The City / Cikin birni

------- This ward another house/Ungwuwar nan wani gidan

-------- Another ward/ Wata ungwuwar ba wannan ba

b) Waje

---------------Nassarawa

-------------- Fagge

--------------S/Gari

--------------Gwagwarwa/Tudun wada

--------------Gyadi-gyadi /Hotoro etc.etc.

-------------- Kurna etc. etc.

--------------- Dorayi/Kabuga etc. etc.

d) ---------------No change/ Ko Ba in da za ka (Give reasons for any of your answer/ Me yasa haka?)..

....

APPENDIX FIVE

Questionaire for Uwargida or Female Head of Compound

{Ward..............................Maigida.......................................No...........................}

1. How many females live here(Ku mata nawa ne gidan nan)?..........

2.What type of occupations do you have (Ko kina da sana'a)?............

3. How did you learn it (A ina kika koya)?..

4. How long have you been doing it (Tun yaushe kike yin wannan sana'a)?..

5. What were you doing before taking it up (Kin taɓa yin wata sana'ar)?...

6. How many women have occupations in this house (Mata nawa ke da sana'a a gidan nan?)...

7. What are these (Gaya min irin sana'oin)?...(list them)

....

8. Are all of the women in purdah(Duk matan gidan nan ke kulle)?...If No

9. Those working outside (Su nawa suke zuwa aiki)?.......................

10. What kind of work do they do (wane irin ayyuka suke yi)? ....

....

11. Where are you from (Ina ne garin ku)?..

12. Were you born & brought up there (Can aka haife ki, kuma can kika girma)?..(town/village/ward)

13. Is it the same with most other women in this house (Sauran matan gidan fa)?..

14. Which part of this house do you spend most of your time (Wane sashen gidan nan kika fi zama)...?

15.Which part of this house do women spend most of their time (Wane sashen gidan nan mata suka fi zama)?...(in order of pref/ a fara da wanda aka fi so)

14. Which part of this house do men spend most of their time (Wane sashen gidan nan maza suka fi dimanta)?..

....

...........................(in order of pref / a fara da wanda aka fi so)

15. Which part of this house do children spend most of their time (Wane sashen gidan nan yara suka fi zama..

....(in order of pref/ a fara da wanda aka fi so)

16. Where do most women recieve their guests (Ina mata ke karɓar baƙinsu)? ....

....

17. Where do most men recieve their guests (Ina maza ke karɓar baƙinsu)?.............

....

18. Where do most women eat (wane wuri mata suka fi zama cin abinci)?...

19.Where do most men eat (wane wuri maza suka fi zama cin abinci)? ....

....

20) Where do women sleep? What about the men(Ina ku mata kuka fi kwanciya barci? Mazan gidan fa)? ....

21.Where do most children eat (wane wuri yara suka fi zama cin abinci? ....
....sleep (barci fa)?........................

22. What major changes would you like to see done in this house
(Wa ne irin gyare -gyare ko sabon salo kike son ki gani an yi a gidan nan)?...

....

....

....(give reasons /yi cikakken bayani)

23.Which part of Kano do you think is the best place to live in (Wane wuri ko ungwuwa a garin nan ki ke jin yafi ko ina baki sha a'war ki zauna a ciki)?..
Why (Don me)?...

24. Which part of Kano do you think is the worst place to live in (Wane wuri ko ungwuwa a garin nan ka ke jin ka fi ƙyamar zama a ciki fiye da ko ina)?

....

Why (Don me)?...

....

APPENDIX 6 OFFICIAL LIST OF KANO CITY WARDS 1994

SUNAYEN UNGWUWOYI FUSKAR GABAS DA YAWAN GIDAJEN KO WACE UNGWUWA
A yau, 01 June 1994

1.Koki	326	20.Mazan Kwarai	114
2.Kofar Wambai	327	21.Sharfadi	113
3. Dama	231+33	22.Tudun Wada	59 (+ 14 A B C)
4.'Yan Awaki	290	23. Kwalwa	93
5.Kudufawa	251	24.Tafalawa	88
6.Gabrei	228	25. 'Yan Mauci	86
7.Chiromawa	215	26. 'Yan Doya	82
8.Masukwani	214	27. Jujin 'Yan Labo	80
9. Agadasawa	200	28.Lallokin Lemu	73
10.Bakin Zuwo	188	29.Zaitawa	71
11.Sharibi	188	30.Chediyar Kuda	70
12. Tudun Nufawa	165 (+ 120 A B C)	31.Makafin K. Wambai	65
13. Makwarari	155	32.Chediyar Fero	60
14. Dukawa	164	33. Durumin Azbahi	58
15.Salamta	141	34.Dambazau	56
16. Zangon Bare-bari	140	35. Kwarin Mafuga	56
17.Yola	140	36. Alkantara	50
18.Kirmo	124	37 Mallam Gunal	39
19.Chedi	120	38. Diganda	37

WAKILIN GABAS

Alhaji ...

Wakilin Fuskar Gabas Kano

UNGWUWOYIN FUSKAR KUDU
(Karkashin Wakilin Fuskar Kudu Alhaji Magaji Chiroma)
An jera su domin mal bincike Mallam A.A Muhammad-Oumar
Bartlett Graduate School University College London

1. 'Alfindiki
2. Dandalji
3. Dogarai
4. Dorayi
5. Durumin Iya
6. Durumin Zungura
7. Gidan Sarki
8. Gwangwazo
9. Indabawa
10. Kabara
11. Kankarofi
12. Kofar Mata
13. Kofar Nassarawa
14. Kurawa
15. Kurmawa
16. Mandawa
17. Rimin Kira
18. Sagagi
19. Soron Dinki
20. Sheshe
21. Tudun Wazirci
22. Ungwuwar Gini
23. Waikilawa
24. Yakasai A
25. Yakasai B
26. Zage
27. Zaitgo

28/7/94

Alhaji Magaji Chiroma
Wakilin Fuskar Kudu

SUNAYEN UNGWUWOYI FUSKAR YAMMA July 1994

1. Akwa
2. Ayagi
3. Bakin Ruwa
4. Ciranci
5. Dandago
6. Dausayi
7. Diso
8. Dogon Nama
9. Galadanci
10. Gorangamawa
11. Gwalo
12. Gwauron Dutse
13. Gyaranya
14. Hausawa
15. Jingau
16. Kabuga
17. Kalgama
18 Kofar Dukawuya
19. Kofar Gidan Kaya
20. Kofar Kabuga
21. Kofar Kansakali
22. Kofar Waika
23. Lokon Makera
24. Madigawa
25. Madunguruwa
26. Magashi
27. Magoga
28. MaiAduwa
29. Mandawari
30. MaiLadan
31. Mararraba
32. Rijiya Hudu
33. SabonSara
34. Sanka
35. Sani Mai Naggo A
36. Sani Mai Naggo B
37. Sudawa
38. Warure
39. 'Yar Kasuwa
40. Yolwa

Wakilin Yamma

18/7/94

SUNAYEN UNGWUWOYIN FUSKAR AREWA

1. Adakawa
2. Alkawa
3. Arzai
4. Cediya('r 'Yan Gurasa)
5. Dala
6. Dandali('n Turawa)
7. Darmawa
8. Dukurawa
9. Durumin Daje
10. Gangamau
11. Gaske
12. Gwammaja A
13. Gwammaja B
14. Juma
15. Kabawa
16. Kabuwaya
17. Kangiwa
18 Kantudu
19. Kofar Ruwa
20. Kofar Mazugal
21. Limanci
22. Madabo
23. Makafin Dala
24. Makwalla
25. Masakar Kuda
26. Mazugal
27. Mazugal Kudu
28. Rijiya Biyu
29. Sarari
30. Shamsari
31. Shirawa
32. Tudun Makera
33. 'Yan Tandu

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1. Dan Dusha Gabas
2. Dan Dusha Yamma
3. Dawanau
4. Kofar Ruwa

27/7/94

WAKILIN AREWA

Wakilin Arewa

APPENDIX 7a : SAMPLE FLOOR AREA DETAILS

No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M 2			Main Functional Space Total Area M 2				Main Functional Space Mean Area M 2				Tot. Room Area	Area Per Person M^2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	Daki	Zaure	Court	Rumfa	Daki	Dk + Rf	Room (Dk + Rf)	Total	
1	ADK -1	1	4	C	2.000	70.65	0.00	70.65	13.82	16.05	0.00	10.51	6.91	16.05	0.00	5.25	10.51	2.63	17.66	0.227
2	ADK -2	1	15	C	2.143	305.14	0.00	305.14	19.68	96.32	26.72	61.42	9.84	48.16	13.36	8.77	88.14	5.88	20.34	0.316
3	ADK -3	1	5	C	2.500	93.13	0.00	93.13	7.38	23.12	5.94	12.09	7.38	23.12	5.94	6.05	18 03	3.61	18.63	0.248
4	ADK -4	4	38	B	5.429	247.62	0.00	247.62	12.35	90.07	25.41	41.15	12.35	18.01	6.35	5.88	66.56	1.75	6.52	0.364
5	ADK -5	4	20	C	3.333	221.08	0.00	221.08	10.92	69.72	29.27	34.93	5.46	23.24	5.85	5.82	64.20	3.21	11.05	0.315
6	ALF -1	1	7	C	3.500	149.00	0.00	149.00	8.00	36.40	12.00	24.40	4.00	18.90	12.00	12.25	36.50	5.21	21.29	0.244
7	ALF -2	1	7	B	1.400	137.50	71.30	208.80	15.40	14.00	43.40	46.00	7.69	14.00	21.75	9.20	89.40	12.77	29.83	0.067
8	ALF -3	1	7	C	1.100	287.75	250.25	538.00	117.00	37.50	96.20	77.30	23.40	37.50	32.10	9.66	173.60	24.80	76.86	0.070
9	ALF -4	1	15	B	2.100	174.50	155.40	329.90	12.50	19.10	27.00	59.30	6.13	19.13	13.50	8.46	86.30	5.75	21.99	0.058
10	ALF -5	1	10	C	3.300	150.50	0.00	150.50	16.60	32.80	9.00	29.50	5.54	16.40	9.00	9.80	38.50	3.85	15.05	0.218
11	ALF -6	1	10	C	1.600	155.00	49.00	204.00	80.80	10.50	21.20	54.40	16.15	10.50	10.63	9.10	75.60	7.56	20.40	0.051
12	ALF -7	1	18	C	6.000	289.90	0.00	289.90	68.50	59.50	46.00	50.50	34.25	59.50	23.00	16.83	96.50	5.36	16.11	0.205
13	ALF -8	4	22	C	2.400	255.00	31.50	286.50	23.20	82.90	34.50	74.90	7.73	41.44	6.90	8.32	109.50	4.98	13.02	0.289
14	BRW -1	2	16	C	3.202	123.00	67.53	190.53	27.22	25.00	4.40	40.73	13.61	25.00	4.40	8.15	45.13	2.82	11.91	0.203
15	BRW 2	1	7	C	3.500	143.65	0.00	143.65	29.14	28.90	9.07	10.14	9.71	28.90	9.07	5.07	19.21	2.74	20.52	0.201
16	BRW 3	1	4	B	4.000	125.00	0.00	125.00	31.22	26.90	13.46	14.18	15.61	26.90	13 46	14.18	27.64	6 91	31 25	0.215
17	BRW 4	1	13	B	1.856	188.50	0.00	188.50	23.64	47.48	11.42	43.50	11.82	47.48	11.42	6.21	54.92	4.23	14.50	0.252
18	BRW 5	2	10	C	1 999	127.00	0.00	127.00	9.26	21 30	14.87	23.96	4.63	10.65	3.72	4.79	38.83	3.88	12.70	0.168
19	BZW 1	1	7	B	1.170	168.26	24.05	192.31	16.96	34.15	6.10	35.04	16.96	34.15	6.10	5.84	41.14	5.88	27.47	0.203
20	BZW -2	1	6	C	3.000	168.90	0.00	168.90	36.33	42.96	15.63	31.18	12.11	42.96	15.63	15.59	46.81	7.80	28 15	0.254
21	BZW -3	1	6	B	1.200	60.57	52.98	113.55	5.93	13.38	19.82	25.24	5.93	13.38	6.60	5.05	45.06	7.51	18.93	0.221
22	BZW -4	1	5	C	3.250	73.49	0.00	73.49	6.58	29.76	0.00	20.34	6.58	20.29	0.00	10.17	20.34	4.07	14.70	0.405
23	BZW 5	1	13	B	2.500	156.88	0.00	156.88	23.25	20.25	12.88	26.74	7 75	20.25	12.88	6.69	39.62	3.05	12.07	0.129
24	CDY- 1	2	7	C	2.333	155.58	25.00	180.58	14.69	62.32	19.83	25.65	7.35	62.32	9.92	8.55	45 48	6.50	25.80	0.401
25	CDY- 2	1	12	C	6.000	132.76	31.50	164.26	36.13	29.28	19.00	19.55	12.04	14.64	9.50	9.78	38.55	3.21	13.69	0.221
26	CDY- 3	1	20	C	5.000	176.08	0.00	176.08	31.98	37.54	19.91	24.43	7.99	37.94	9.96	6.11	44.34	2.22	8.80	0.213
27	CDY- 4	2	17	B	5.667	220.18	0.00	220.18	48.77	37.20	21.58	36.09	12.19	37.20	10.79	12.03	57.67	3.39	12.95	0.169
28	CDY- 5	2	17	C	3.400	180.40	31.86	212.26	23.51	36.79	16.05	47.04	23.51	36.79	8.03	9.08	63.09	3.71	12 49	0.204

APPENDIX 7b : SAMPLE FLOOR AREA DETAILS

No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M 2			Main Functional Space Total Area M 2				Main Functional Space Mean Area M 2				Tot. Room Area	Area Per Person M^2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	'Daki	Zaure	Court	Rumfa	'Daki	'Dk + Rf	Room ('Dk + Rf)	Total	
29	DAL-1	1	7	C	1.750	87.50	0.00	87.50	9.86	21.49	0.00	22.07	4.93	10.75	0.00	5.52	22.07	3.15	12.50	0.246
30	DAL-2	2	8	B	0.615	598.39	166.80	765.19	118.80	128.74	112.76	143.90	18.63	42.91	18.79	11.07	256.66	32.08	95.65	0.215
31	DAL-3	2	17	C	4.250	139.00	0.00	139.00	13.71	33.00	0.00	37.74	4.57	33.00	0.00	9.44	37.74	2.22	8.18	0.237
32	DAL-4	1	4	C	2.000	121.90	0.00	121.90	22.74	32.00	7.93	17.67	7.58	32.00	7.93	8.84	25.60	6.40	30.48	0.263
33	DAL 5	1	8	C	4.000	87.39	0.00	87.39	13.23	20.32	5.01	6.78	6.62	20.32	5.01	3.39	11.79	1.47	10.92	0 233
34	DBZ -1	3	9	B	1.800	91.12	81.62	172.74	3.19	15.89	39.33	45.21	3.19	15.89	9.83	9.04	84.54	9.39	19.19	0.174
35	DBZ -2	5	24	C	1.500	1201.50	0.00	1201.50	64.80	397.22	82.18	237.93	16.20	99.31	16.44	14.87	320.11	13.34	50.06	0.331
36	DBZ -3	1	4	C	2.000	197.22	0.00	197.22	37.48	32.08	27.86	22.04	18.74	32.08	13.93	11.02	49.90	12.48	49.31	0.163
37	DBZ -4	3	12	B	3.000	166.45	0.00	166.45	7.41	50.50	13.97	29.20	3.71	37.50	6.99	7.30	43.17	3.60	13.87	0.303
38	DBZ -5	2	15	C	3.000	195.85	30.56	226.46	17.35	65.69	26.41	34.03	8.68	30.57	13.21	6.81	60.44	4.03	15.10	0.335
39	DNL-1	0	3	C	1.500	94.72	22.80	117.50	12.31	36.39	6.51	12.07	6.16	36.39	6.51	6.04	18.58	6.19	39.17	0.384
40	DNL 2	1	9	C	4.500	158.02	46.64	204.66	45.90	27.58	25.14	38.47	15.30	27.58	12.57	19.24	63.61	7.07	22.74	0.175
41	DNL-3	1	7	C	3.500	117.60	0.00	117.60	18.94	31.44	4.43	15.32	9.47	15.72	4.43	7.60	19 75	2.82	16.80	0 267
42	DNL-4	1	12	B	1.714	190.26	23.78	214.04	36.75	31.52	14.84	48.06	9.19	15.76	7.42	6.78	62.90	5.24	17 84	0.166
43	DNL 5	2	11	B	1.833	280.16	39.50	319.66	59.56	40.68	23.33	55.51	11.99	40.68	11.67	9.25	78 84	7.17	29 06	0.145
44	DRM -1	4	29	C	3.63	290.55	37.93	328.48	17.07	77.99	38.19	54.23	8.54	25.99	9.55	6.78	92.42	3.187	11.327	0.268
45	DRM 2	1	7	B	0.3	121	0	121	5.91	35.33	9.27	22.46	5.91	23.65	9.27	7.49	31 73	4.533	17 286	0.292
46	DRM -3	2	10	B	3.3	96.55	0	96.55	11.61	30.9	0	19.79	5.81	10.17	0	6.6	19 79	1.979	9 655	0 32
47	DRM -4	0	1	B	0.75	182.2	54.74	236.94	21.07	54.39	25.65	71.87	7.02	33.06	12.82	8.98	97.52	97.52	236 94	0.299
48	DRM 5	1	6	A	2	127.64	0	127.64	21.52	24.79	5.75	15.66	7.17	24.79	5.75	7.83	21.41	3.568	21.273	0 194
49	DIS 1	8	58	C	1.87	1452.7	205.32	1658.1	111.34	569.94	162.16	308.54	9.28	43.84	13.51	9.95	470 7	8 116	28.587	0 392
50	DIS 2	1	9	B	1.286	193	119.33	312.33	17.75	52	24.99	78.26	4.44	52	8.33	11.18	103 25	11.472	34 703	0.269
51	DIS 3	8	56	C	4.248	284.6	0	284.6	20.07	98.23	15.87	62.55	6.69	10.91	5.29	5.21	78.42	1.4	5.082	0 345
52	DIS 4	1	5	C	1.25	249	0	249	19.05	91.49	16.36	37.32	6.35	45.75	8.18	9.33	53.68	10.736	49.8	0.367
53	DIS 5	1	11	C	5.503	123.77	0	123.77	21.46	21.82	0	21.89	7 15	21.82	0	10.95	21 89	1.99	11.252	0.176

APPENDIX 7c : SAMPLE FLOOR AREA DETAILS

No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M ^{2}			Main Functional Space Total Area M ^{2}				Main Functional Space Mean Area M ^{2}				Tot. Room Area	Area Per Person M^2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	'Daki	Zaure	Court	Rumfa	'Daki	'Dk + Rf	Room ('Dk + Rf)	Total	
54	DKR -1	1	9	C	0.818	251.99	112.8	364.79	47.67	35.43	66.4	94.18	15.89	35.43	33.2	8.56	160.58	17.842	40.532	0.141
55	DKR -2	3	18	C	4.5	173.9	26.77	200.67	19.81	40.45	31.21	28.94	6.6	40.45	15.61	7.24	60.15	3.342	11.148	0.233
56	DKR -3	3	14	C	2.333	174.34	0	174.34	16.78	29.76	34.32	38.4	8.39	29.76	6.86	6.4	72.72	5.194	12.453	0.171
57	DKR -4	1	6	C	1.2	140.18	41.86	182.04	27.86	28.56	15.02	48.86	13.93	28.56	7.51	9.77	63.88	10.647	30.34	0.204
58	DKR -5	1	15	C	3.75	120.57	25.7	146.27	19.78	20.08	21.72	24.77	6.59	20.08	10.86	6.19	46.49	3.099	9.751	0.167
59	DAR -1	2	10	C	3.3	113.93	0	113.93	11.32	28.23	0	24.76	5.66	28.23	0	6.2	24.76	2.476	11.393	0.248
60	DAR -2	2	8	B	1.2	217.54	151.41	355.52	10.58	55.69	29.83	96.47	5.29	55.69	9.94	9.65	126.3	15.788	44.44	0.256
61	DAR -3	1	11	B	1.83	154.89	53.29	208.18	13.59	29.98	20.21	43.85	4.53	14.99	6.74	7.31	64.06	5.824	18.925	0.194
62	DAR -4	1	10	B	2	217.54	0	217.54	23.32	40.07	17.44	52.89	11.66	17.45	17.44	10.58	70.33	7.033	21.754	0.184
63	DAR -5	1	17	A	1.89	392.86	32.36	425.22	74.94	62.34	63.6	82.88	18.74	62.34	15.9	9.21	146.48	8.616	25.013	0.159
64	GBR -1	1	12	A	2.4	198	88.68	286.68	18.99	41.25	57.98	50.08	6.33	41.25	14.5	10.02	108.06	9.005	23.89	0.208
65	GBR -2	1	10	C	2.3	238	0	238	25.41	111.37	0	39.64	6.35	108.22	0	9.91	39.64	3.964	23.8	0.468
66	GBR -3	1	7	C	3.5	156.92	0	156.92	28.23	27.17	5.6	27.38	9.41	27.17	5.6	13.69	32.98	4.711	22.417	0.173
67	GBR -4	1	6	B	1	194.4	0	194.4	22.79	34.86	14.9	35.87	11.4	31.16	14.9	5.98	50.77	8 462	32.4	0.179
68	GBR 5	1	13	B	2.6	146.52	0	146.52	14.94	30.09	4.8	32.89	14.94	30.09	4.8	6.58	37.69	2 899	11.271	0.205
69	JNG -1	4	37	C	4.627	318.22	0	318.22	29.13	105.46	36.79	76.21	9.71	17.58	9.2	9.53	113	3.054	8.601	0.331
70	JNG 2	1	12	C	2.168	205.46	79.82	285.28	25.76	47.88	26.8	74.61	8.59	23.93	13.4	12.44	101.41	8 451	23.773	0.233
71	JNG -3	4	30	C	3.101	225	0	225	19.49	38	23.61	51.88	4.87	12.67	5.9	5.19	75.49	2.516	7.5	0.169
72	JNG 4	7	51	C	5.101	391	0	391	6.86	136.88	44.84	63.89	6.686	45.63	7.47	6 39	108.73	2.132	7.667	0 35
73	JNG 5	3	12	B	2.399	159.6	81.8	241.4	29.94	23.93	39.16	54.92	9.98	23.94	19.58	10.98	94.08	7.84	20.117	0.15
74	KOK 1	1	13	A	1.86	148.98	121.34	270.32	18.61	23.42	20.37	83.68	9.31	23.42	10.19	11.95	104.05	8.004	20.794	0.157
75	KOK -2	1	16	B	1.6	240.9	121.4	362.3	51.88	31.55	31.75	98.47	12.97	25.61	10.58	9.85	130.22	8.139	22.644	0 131
76	KOK -3	1	7	B	1.4	143.2	63.98	207.18	21.58	26.96	12.18	61.22	10.79	26.96	12.18	12.24	73.4	10 486	29 597	0.188
77	KOK -4	1	6	B	3	139.68	0	139.68	27.19	20.05	8.27	16.83	9.06	15.78	8.27	8.42	25.1	4.183	23.28	0.144
78	KOK 5	8	45	C	1.8	696.72	0	696.72	14.41	255.1	23.84	222.12	7.2	34.98	7.95	8.88	245.96	5 466	15.483	0.366

APPENDIX 7d : SAMPLE FLOOR AREA DETAILS

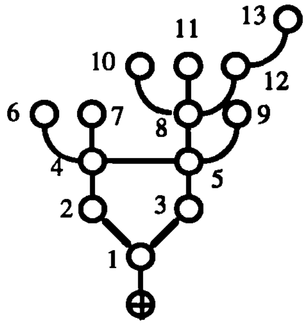
No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M 2			Main Functional Space Total Area M 2				Main Functional Space Mean Area M 2				Tot. Room Area	Area Per Person M2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	'Daki	Zaure	Court	Rumfa	'Daki	'Dk + Rf	Room ('Dk + Rf)	Total	
79	KMG-1	5	34	C	1.94	490.27	0.00	490.27	4.62	143.95	45.31	117.84	4.62	143.95	5.66	6.55	163.15	4.80	14.42	0.294
80	KMG-2	8	47	C	1.62	2076.10	43.72	2119.10	97.03	945.58	246.60	373.27	16.17	40.01	20.55	12.87	619.87	13.19	45.10	0.455
81	KMG-3	1	11	C	2.75	168.93	0.00	168.93	13.98	58.24	8.55	26.23	6.99	38.32	8.55	6.56	34.78	3.16	15.36	0.345
82	KMG-4	1	6	B	6.00	120.92	0.00	120.92	15.96	36.30	11.10	8.26	7.98	26.33	11.10	8.26	19.36	3.23	20.15	0 300
83	KMG-5	2	13	B	2.60	148.73	0.00	148.73	14.05	21.71	17.12	30.12	7.03	18.81	5.71	6.02	47.24	3.63	11.44	0.146
84	LMK -1	2	16	C	1.99	258.44	0.00	258.44	23.55	69.97	0.00	63.87	11.78	23.22	0.00	7.94	63.87	3.99	16.15	0.271
85	LMK -2	1	12	C	1.71	241.74	128.43	370.17	23.33	67.19	38.64	119.37	11.66	67.19	12.88	17.05	158.01	13.17	30.85	0.278
86	LMK -3	1	6	C	1.20	91.88	62.00	153.88	18.92	27.96	6.52	44.88	6.31	27.96	3.26	8.98	51.40	8.57	25.65	0 304
87	LMK -4	2	4	C	1.33	178.02	0.00	178.02	16.15	52.63	15.00	29.40	8.08	52.63	15.00	9.80	44.40	11.10	44.51	0.296
88	LMK -5	1	11	C	3.67	226.26	0.00	226.26	11.79	88.59	6.04	33.77	5.90	29.53	6.04	11.26	39.81	3.62	20.57	0.392
89	MDB -1	1	33	C	3.67	450.64	0.00	450.64	40.59	126.71	43.65	68.37	8.12	21.12	8.61	7.60	112.02	3.40	13.66	0.281
90	MDB -2	1	19	C	3.80	221.71	0.00	221.71	22.77	78.82	5.95	31.03	5.69	39.41	5.95	6.21	36.98	1.95	11.67	0.356
91	MDB -3	1	9	C	3.00	149.49	0.00	149.49	25.94	15.20	6.67	26.31	8.65	7.60	6.67	8.77	32.98	3.66	16.61	0 102
92	MDB-4	8	62	C	4.13	542.02	0.00	542.02	16.09	130.10	76.46	104.56	5.36	26.02	6.95	6 97	181 02	2.92	8.74	0 240
93	MDB -5	2	10	C	5.00	91.81	0.00	91.81	8.84	17.25	7.02	19.17	8.84	17.25	7.02	9.58	26.19	2.62	9.18	0.188
94	MGN-1	1	6	B	3.00	120.94	13.75	134.69	21.24	22.03	8.27	13.52	7.08	22.03	8 27	6.76	21.79	3.63	22.45	0 182
95	MGN-2	1	5	C	1.67	165.18	35.27	200.45	16.43	27.99	14.23	61.86	8.22	27.99	14.23	20.62	76.09	15.22	40.09	0.169
96	MGN-3	1	5	B	5.00	75.74	0.00	75.74	6.55	13.96	5.26	6.76	6.55	13.96	5.26	6.76	12.02	2.40	15.15	0.184
97	MGN-4	1	11	C	2.75	136.68	49.44	186.12	10.89	20.15	50.58	46.39	5.45	20.15	16.86	11.60	96.97	8 82	16.92	0.147
98	MGN-5	1	12	B	3.00	105.14	20.05	125.19	10.48	16.11	14.94	28.63	5.24	8.55	7.47	7.16	43.57	3.63	10.43	0.153
99	SMN -1	1	13	C	1.86	203.82	84.30	288.12	18.58	56.61	42.47	53.21	9.29	28.31	10.62	7.60	95.68	7.36	22.16	0 278
100	SMN -2	1	8	C	2.00	170.50	0.00	170.50	7.79	34.64	11.80	39.34	7.79	17.32	11.80	9.84	51.14	6.39	21.31	0.203
101	SMN -3	1	5	C	1.67	97.12	0.00	97.12	6.64	26.48	0.00	29 82	3.32	26.48	0.00	9.94	29 82	5.96	19.42	0 273
102	SMN -4	1	10	C	1.67	190.02	26.74	216.76	21.31	44.67	31.07	45.10	7.10	44.67	7.77	7.52	76.17	7.62	21.68	0.235
103	SMN -5	1	12	C	2.40	244.70	4.78	289.48	20.50	61.30	44.90	51.96	10.25	61.30	11.23	10.39	96.86	8.07	24.12	0.251

APPENDIX 7e : SAMPLE FLOOR AREA DETAILS

No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M 2			Main Functional Space Total Area M 2				Main Functional Space Mean Area M 2				Tot. Room Area	Area Per Person M^2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	Daki	Zaure	Court	Rumfa	Daki	Dk + Rf	Room (Dk + Rf)	Total	
104	SRF -1	1	5	C	1.67	87.11	22.81	109.92	10.84	16.35	8.75	30.13	5.42	16.35	8.75	10.04	38.88	7.78	21.98	0.188
105	SRF -2	2	10	C	2.00	210.90	0.00	210.90	24.28	69.31	0.00	37.49	8.09	15.33	0.00	7.52	37.49	3.75	21.09	0.329
106	SRF -3	2	14	C	2.80	188.15	0.00	188.15	21.51	51.71	6.00	39.61	5.38	22.55	6.00	7.92	45.61	3.26	13.44	0.275
107	SRF -4	1	6	B	2.00	171.45	0.00	171.45	27.86	47.68	11.42	22.75	9.29	47.68	11.42	7.58	34.17	5.70	28.58	0.278
108	SRF -5	1	5	B	5.00	56.17	0.00	56.17	7.53	13.80	8.78	8.13	7.53	13.80	8.78	8.13	16.91	3.38	11.23	0.246
109	SHS -1	1	6	C	2.00	111.60	40.00	151.60	17.40	58.80	11.90	20.00	5.80	29.38	5.94	6.67	31.90	5.32	25.27	0.388
110	SHS -2	1	4	C	1.30	113.60	0.00	113.60	13.50	16.30	14.50	21.50	6.75	16.25	14.50	7.17	36.00	9.00	28.40	0.143
111	SHS -3	0	3	C	3.00	99.00	0.00	99.00	15.50	17.30	10.50	8.50	7.75	17.25	10.50	8.50	19.00	6.33	33.00	0.175
112	SHS -4	1	5	C	1.00	285.00	38.30	323.30	58.50	38.80	51.80	101.30	14.63	38.75	17.25	20.25	153.10	30.62	64.66	0.120
113	SHS -5	1	21	B	3.00	250.50	70.80	321.30	31.30	34.50	40.30	62.80	6.25	17.25	10.10	8.96	103.10	4.91	15.30	0.107
114	SDK -1	1	4	C	2.00	204.50	0.00	204.50	51.00	44.50	12.50	29.50	17.00	22.25	12.50	14.75	42.00	10.50	51.13	0.218
115	SDK -2	1	9	B	3.00	329.40	0.00	329.40	16.50	199.80	38.50	50.80	5.50	199.80	19.25	16.92	89.30	9.92	36.60	0.607
116	SDK -3	1	10	C	1.60	318.63	32.97	351.60	49.80	49.30	29.00	61.00	15.20	24.00	0.00	7.71	90.00	4.29	16.74	0.140
117	SDK -4	4	21	B	2.30	272.30	0.00	272.30	60.80	72.00	0.00	46.20	8.30	9 85	9.67	6.78	46.20	4.62	27.23	0.264
118	SDK 5	1	19	A	2.10	436.40	0.00	436.40	12.00	158.40	0.00	60.90	12.00	31.68	0.00	6.76	60.90	3.21	22.97	0.363
119	SDK 6	1	8	C	1.60	236.10	0.00	236.10	29.10	126.90	10.30	35.50	9.70	25.40	10.31	7.01	45 80	5.73	29 51	0.537
120	SDK -7	2	26	C	2.80	507.00	0.00	507.00	48.50	183.50	43.30	71.50	9.70	36.70	14.42	7.94	114.80	4.42	19.50	0.362
121	SDK 8	1	12	C	5 00	48.00	0.00	48.00	12.00	12.00	149.00	8.10	6.00	12.00	6.00	8.13	14.10	2.82	9 60	0.250
122	TMK 1	1	4	C	2	70.06	0	70.06	4.49	14.53	5.32	13.13	4.49	14.53	5.32	6.57	18.45	4.613	17.515	0.207
123	TMK-2	1	11	C	5.5	141.46	0	141.46	26.78	36.5	9.2	15.19	6.7	36.5	9.2	7.5	24.39	2.217	12 86	0.258
124	TMK 3	1	5	C	2.5	79.03	0	79.03	9.09	12.54	7.36	15.04	4.54	12.54	7.36	7.52	22.4	4 48	15 806	0.159
125	TMK 4	2	11	C	2.75	163.9	0	163.9	17.41	25.97	18.9	37.93	8.71	12.99	9.45	9.48	56.83	5.166	14.9	0.158
126	TMK-5	2	10	C	2.5	130.95	0	130.95	8 38	23.97	17.12	26.07	4.19	23.97	5.71	6.52	43.19	4.319	13 095	0.183
127	TNF-1	3	12	C	3	251.44	0	251.44	24.07	108.84	0	46.77	12.04	108.84	0	11.69	46.77	3.898	20.953	0.433
128	TNF-2	1	33	C	2 75	357.21	38.94	396.15	17.87	110.51	30.77	88.14	5.96	27 63	10.26	7.35	118.91	3.603	12 005	0.309
129	TNF-3	1	13	C	4.33	221.57	0	221.57	38.83	49.55	17.11	18.64	9.71	14.29	8.56	6.21	35.75	2.75	17 044	0.224
130	TNF-4	1	2	B	0.6	117.55	21.81	139.36	21.93	12.92	22.95	17.83	7.31	8.62	11.48	5.94	40.78	20.39	69.68	0.11
131	TNF 5	1	9	B	1.29	201.29	43.84	245.13	20.07	35.54	17.35	69.63	6.69	17.77	8.68	9.95	86.98	9.664	27 237	0.177

APPENDIX 7f : SAMPLE FLOOR AREA DETAILS

No.	House	Famly	Popul.	Income	Room Occupncy	Unit Floor Area M 2			Main Functional Space Total Area M 2				Main Functional Space Mean Area M 2				Tot. Room Area	Area Per Person M^2		Opacity
						Ground	Upper	Total	Zaure	Court	Rumfa	Daki	Zaure	Court	Rumfa	Daki	Dk + Rf	Room (Dk + Rf)	Total	
132	UGN-1	1	12	B	4	181.25	72.25	253.5	29.5	53	21	36.8	9.83	53	21	12.25	57.8	4.817	21.125	0.209
133	UGN-2	1	17	B	1.5	307.88	155.22	463.1	25.6	107	98.8	110.1	6.4	53.5	12.34	10.01	208.9	12.288	27.241	0.231
134	UGN-3	1	8	C	3	125	0	125	16	23	0	50.5	8	23	0	16.83	50.5	6.312	15.625	0.184
135	UGN-4	1	11	C	2.6	200.4	0	200.4	20	84.3	0	52.5	10	84.25	0	13.12	52.5	4.773	18.218	0.421
136	UGN-5	1	9	C	2.7	213.5	0	213.5	40	63.8	10	22.5	13.3	31.88	5	7.5	32.5	3.611	23.722	0.299
137	UGN-6	2	17	C	2.8	239	0	239	28	67	20.8	54.8	9.33	33.5	10.38	9.13	75.6	4.447	14.059	0.28
138	UGN-7	1	12	B	4	81	0	81	4.7	18	0	29.6	4.73	18	0	9.88	29.6	2.467	6 75	0.222
139	UGN-8	3	21	C	3.5	320.6	0	320.6	34.5	82.3	0	76.5	17.25	82.25	0	12.75	76.5	3.643	15.267	0.257
140	WRR-1	1	8	C	2.666	145.6	0	145.6	17.59	40.57	10.14	26.26	8.8	43.6	9.62	8.95	36.4	4.55	18.2	0.279
141	WRR-2	2	8	C	1.143	161.64	44.98	206.62	17.25	43.6	19.23	62.64	8.88	43.6	9.62	8.95	81 87	10.234	25.827	0.27
142	WRR-3	2	6	C	3	181.86	0	181.86	23.84	72.63	0	15.84	7.95	36.32	0	7.92	15.84	2.64	30.31	0.399
143	WRR-4	1	6	C	1.2	228.08	0	228.08	38.18	54.62	15.33	36.86	12.73	54.62	15.33	7.37	52.19	8.698	38.013	0.239
144	WRR-5	4	37	C	2.644	440.6	59.86	500.46	25.72	107.47	66.73	130.84	6.43	35.82	13.35	9.35	197.57	5.34	13.526	0.244
145	YKS-1	1	11	B	1.8	309.38	54.02	363.4	65	80.6	24.6	60.2	16.25	40.28	12.31	10.04	84.8	7.709	33.036	0.222
146	YKS-2	2	18	C	3.6	122.5	0	122.5	25	26.4	0	36.5	8.35	26.38	0	7.3	36.5	2.028	6 806	0 216
147	YKS-3	2	20	C	2.5	292	209.3	501.3	73.3	82.8	45.2	86.7	14.65	41.38	11.31	10.84	131 9	6 595	25 065	0.165
148	YKS 4	2	4	C	2	111.1	0	111.1	18.8	51.3	15	21.4	9.4	51.25	15	10.69	36.4	9.1	27.775	0.462
149	YKS-5	3	8	C	2	179.5	0	179.5	29	44.8	0	45	7.25	22.38	0	11.25	45	5.625	22 438	0 25
150	ZNG - 1	2	16	C	2.3	266.5	0	266.5	39	65	12 5	47.5	9.75	21.67	6.25	6.79	60	3.75	16.656	0 244
151	ZNG - 2	4	35	C	3.9	245.5	0	245.5	10.5	49	15.3	73.8	10.5	16.33	7.63	8.2	89.1	2 546	7 014	0 2
152	ZNG - 3	7	52	C	3.5	1005	0	1005	72.1	333.8	50	206	10.3	37.08	16.67	13.73	256	4.923	19.327	0 332
153	ZNG - 4	1	10	B	1.4	150	35	185	7.5	35.5	16.5	59	7.5	11.83	8.25	8.43	75.5	7.55	18.5	0 192
154	ZNG - 5	1	10	C	5	164.3	0	164.3	47.2	26.5	12.5	22.5	11.8	26.5	12.5	11.25	35	3.5	16 43	0 161
155	ZNG 6	1	2	C	1	131.3	0	131.3	9	12.5	35.8	18	4.5	12.5	17.88	9	53.8	26.9	65 65	0 095
156	ZBR-1	2	21	C	2 63	184.77	115 85	300.62	8.58	36.47	35.19	86.55	8.58	36.47	11.73	10.82	121.74	5.797	14 315	0.197
157	ZBR 2	1	7	B	7	137.02	0	137.02	36.71	24.33	10.26	12.15	9.18	24.33	10.26	12.15	22 41	3.201	19.574	0.178
158	ZBR-3	1	11	B	2.2	193.18	42.26	235.44	20.25	36.73	32.18	42.78	6.75	36.73	16.09	8.56	74 96	6.815	21 404	0 19
159	ZBR-4	2	8	C	1	413.58	0	413.58	38.08	135.94	54.19	70.21	12.69	34.46	10.84	8.78	124.4	15.55	51.697	0.329
160	ZBR 5	2	13	C	2.17	233.3	0	233.3	19.33	38	41.59	68.08	9.67	38	20.8	11.35	109 67	8.436	17.946	0.163



6 x 1 = 6
5 x 3 = 15
4 x 4 = 16
3 x 2 = 6
2 x 2 = 4
1 x 1 = 1
0 x 1 = 0

Σn 48

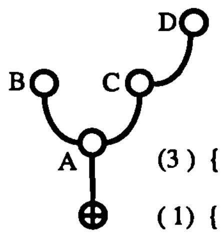
k(number of covex spaces) = 14

$$\text{MD (mean depth)} = \frac{\Sigma n}{k-1} = \frac{48}{13} = 3.69$$

$$\text{Relative Assymetry (RA) or Integration} = \frac{2\,(\text{MD} - 1)}{k-2} = 0.307$$

This value of Integration is for the root - in this case the exterior. To calculate the Integration value of each space a justified graph of the system is drawn with that space as the root.

(2) O{1/3 + 1/3} 0.66*



(1) { 1/3 } 0.333*

(3) { 1+ 1/2 + 1/3} 1.833*

(3) { 1+ 1/2 + 1/3} 1.833*

(1) { 1/3 } 0.333*

APPENDIX 8 : COMPUTATION OF RRA / CONTROL

APPENDIX 9a. HOUSE DIMENSIONS ESTIMATE: CONTROL FOR ERROR

House No. 1	LENGTH (Metres)			WIDTH (Metres)			AREA(Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	2.100	2.200	**4.545**	2.900	2.860	**1.399**	6.090	6.292	**3.210**
2	2.100	2.100	**0.000**	2.900	2.850	**1.754**	6.090	5.985	**1.754**
3	3.100	2.950	**5.085**	2.800	2.920	**4.110**	8.680	8.614	**0.766**
4	5.900	5.900	**0.000**	5.900	6.170	**4.376**	34.810	36.403	**4.376**
5	3.100	3.300	**6.061**	1.950	1.970	**1.015**	6.045	6.501	**7.014**
6	1.800	1.750	**2.857**	3.100	3.230	**4.025**	5.580	5.653	**1.283**
7	1.900	1.900	**0.000**	3.500	3.380	**3.550**	6.650	6.422	**3.550**
8	1.100	1.100	**0.000**	1.900	2.050	**7.317**	2.090	2.255	**7.317**
House No. 2	LENGTH IN (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	2.600	2.590	**0.386**	1.750	1.700	**2.941**	4.550	4.403	**3.339**
2	2.600	2.310	**12.554**	1.750	1.720	**1.744**	4.550	3.973	**14.517**
3	1.700	1.600	**6.250**	1.700	1.890	**10.053**	2.890	3.024	**4.431**
4	4.500	4.200	**7.143**	5.200	5.700	**8.772**	23.400	23.940	**2.256**
5	1.600	1.800	**11.111**	1.800	1.850	**2.703**	2.880	3.330	**13.514**
6	3.200	2.950	**8.475**	1.950	2.370	**17.722**	6.240	6.992	**10.749**
7	3.000	2.700	**11.111**	1.800	1.940	**7.216**	5.400	5.238	**3.093**
8	2.500	3.000	**16.667**	1.900	1.630	**16.564**	4.750	4.890	**2.863**
9	3.000	2.680	**11.940**	1.500	1.650	**9.091**	4.500	4.422	**1.764**
10	1.700	1.870	**9.091**	2.900	2.850	**1.754**	4.930	5.330	**7.496**
11	3.000	2.850	**5.263**	2.200	2.310	**4.762**	6.600	6.584	**0.251**
12	3.200	2.950	**8.475**	2.500	2.720	**8.088**	8.000	8.024	**0.299**

APPENDIX 9b. HOUSE DIMENSIONS ESTIMATE: CONTROL FOR ERROR

House No. 3	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	3.100	3.300	**6.061**	3.500	3.300	**6.061**	10.850	10.890	**0.367**
2	3.300	3.300	**0.000**	2.500	2.450	**2.041**	8.250	8.085	**2.041**
3	2.800	2.750	**1.818**	2.000	2.000	**0.000**	5.600	5.500	**1.818**
4	2.900	2.750	**5.455**	2.900	3.110	**6.752**	8.410	8.553	**1.666**
5	3.700	3.820	**3.141**	1.900	1.970	**3.553**	7.030	7.525	**6.583**
6	1.700	1.580	**7.595**	5.400	5.750	**6.087**	9.180	9.085	**1.046**
7	2.500	2.350	**6.383**	3.600	3.800	**5.263**	9.000	8.930	**0.784**
8	1.800	1.710	**5.263**	2.300	2.590	**11.197**	4.140	4.429	**6.523**
9	1.700	1.780	**4.494**	1.500	1.480	**1.351**	2.550	2.634	**3.204**
10	2.400	2.550	**5.882**	2.500	2.500	**0.000**	6.000	6.375	**5.882**

House No. 4	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	3.000	2.890	**3.806**	3.000	2.890	**3.806**	9.000	8.352	**7.757**
2	1.500	1.450	**3.448**	3.100	3.900	**20.513**	4.650	5.655	**17.772**
3	1.900	2.100	**9.524**	2.800	2.760	**1.449**	5.320	5.796	**8.213**
4	3.500	3.300	**6.061**	2.300	2.570	**10.506**	8.050	8.481	**5.082**
5	2.500	2.250	**11.111**	3.200	3.260	**1.840**	8.000	7.335	**9.066**
6	3.500	3.750	**6.667**	5.500	5.100	**7.843**	19.250	19.125	**0.654**
7	1.100	1.250	**12.000**	2.100	1.680	**25.000**	2.310	2.100	**10.000**
8	1.500	1.350	**11.111**	2.000	2.150	**6.977**	3.000	2.903	**3.359**
9	2.000	1.920	**4.167**	2.400	2.520	**4.762**	4.800	4.838	**0.794**
10	2.000	1.870	**6.952**	2.000	1.960	**2.041**	4.000	3.665	**9.135**
11	2.500	2.500	**0.000**	2.500	2.480	**0.806**	6.250	6.200	**0.806**
12	2.000	1.900	**5.263**	2.500	2.600	**3.846**	5.000	4.940	**1.215**
13	2.500	2.450	**2.041**	2.500	2.450	**2.041**	6.250	6.003	**4.123**

APPENDIX 9c. HOUSE DIMENSIONS ESTIMATE: CONTROL FOR ERROR

House No. 5	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	1.200	1.100	**9.091**	6.100	6.720	**9.226**	7.320	7.392	**0.974**
2	3.700	3.560	**3.933**	2.100	2.440	**13.934**	7.770	8.686	**10.550**
3	2.000	1.850	**8.108**	2.400	2.360	**1.695**	4.800	4.366	**9.940**
4	4.000	3.720	**7.527**	2.100	2.280	**7.895**	8.400	8.482	**0.962**
5	3.100	2.880	**7.639**	2.300	2.380	**3.361**	7.130	6.854	**4.021**
6	4.100	3.950	**3.797**	2.600	2.850	**8.772**	10.660	11.258	**5.308**
7	4.500	4.200	**7.143**	2.100	2.440	**13.934**	9.450	10.248	**7.787**
8	3.800	3.750	**1.333**	2.500	2.670	**6.367**	9.500	10.013	**5.119**
9	8.100	8.400	**3.571**	1.300	1.460	**10.959**	10.530	12.264	**14.139**
10	5.500	5.350	**2.804**	4.100	4.520	**9.292**	22.550	24.182	**6.749**
11	2.000	1.850	**8.108**	4.300	4.670	**7.923**	8.600	8.640	**0.457**
12	1.100	1.450	**24.137**	1.300	1.450	**10.345**	1.495	2.103	**28.894**
13	1.800	1.650	**9.091**	1.500	1.810	**17.127**	2.700	2.987	**9.593**
14	1.100	1.140	**3.509**	1.300	1.300	**0.000**	1.430	1.482	**3.509**
15	1.500	1.430	**4.895**	3.500	3.890	**10.026**	5.250	5.563	**5.621**
16	1.600	1.590	**0.629**	3.500	3.890	**10.026**	5.600	6.185	**9.460**
House No. 6	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	2.000	1.900	**5.263**	3.100	3.110	**0.322**	6.200	5.909	**4.925**
2	3.500	3.200	**9.375**	1.900	1.880	**1.064**	6.650	6.016	**10.539**
3	2.200	2.100	**4.762**	2.500	2.690	**7.063**	5.500	5.649	**2.638**
4	3.300	3.450	**4.348**	7.000	6.860	**2.041**	23.100	23.667	**2.396**
5	1.000	1.250	**20.000**	2.100	1.820	**15.385**	2.100	2.275	**7.692**
6	2.300	2.400	**4.167**	2.300	2.310	**0.433**	5.290	5.544	**4.582**
7	2.500	2.350	**6.383**	3.000	3.030	**0.990**	7.500	7.121	**5.330**
8	3.200	3.250	**1.538**	3.000	2.850	**5.263**	9.600	9.263	**3.644**
9	3.300	3.400	**2.941**	3.000	2.850	**5.263**	9.900	9.690	**2.167**

APPENDIX 9d. HOUSE DIMENSIONS ESTIMATE: CONTROL FOR ERROR

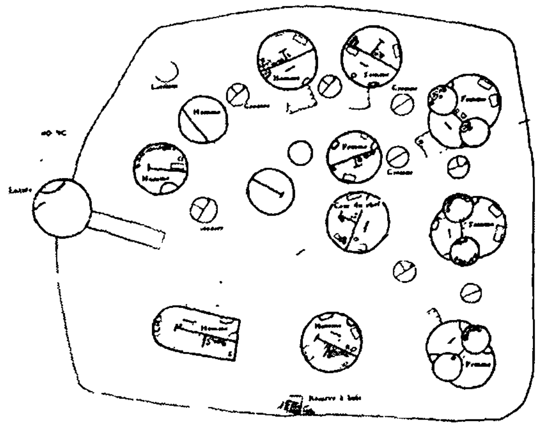
House No. 7	LENGTH (Square Metres)			WIDTH (Square Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	3.500	3.300	**6.061**	3.500	3.620	**3.315**	12.250	11.946	**2.545**
2	2.200	2.250	**2.222**	2.300	2.200	**4.545**	5.060	4.950	**2.222**
3	1.000	0.950	**5.263**	3.000	3.300	**9.091**	3.000	3.135	**4.306**
4	3.700	3.770	**1.857**	2.300	2.300	**0.000**	8.510	8.671	**1.857**
5	2.000	1.900	**5.263**	2.500	2.440	**2.459**	5.000	4.636	**7.852**
6	14.500	13.980	**3.720**	7.500	7.700	**2.597**	108.750	107.646	**1.026**
7	3.000	2.900	**3.448**	4.300	4.280	**0.467**	12.900	12.412	**3.932**
8	2.500	2.600	**3.846**	3.500	3.730	**6.166**	8.750	9.698	**9.775**
9	3.000	3.300	**9.091**	4.100	3.800	**7.895**	12.300	12.540	**1.914**
10	2.600	2.450	**6.122**	2.700	2.740	**1.460**	7.020	6.713	**4.573**

House No. 8	LENGTH (Square Metres)			WIDTH (Square Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	5.500	5.100	**7.843**	2.500	2.460	**1.626**	13.750	12.546	**9.597**
2	1.600	1.550	**3.226**	3.000	3.250	**7.692**	4.800	5.038	**4.715**
3	4.500	4.250	**5.882**	3.000	3.290	**8.815**	13.500	13.983	**3.451**
4	1.500	1.530	**1.961**	1.500	1.630	**7.975**	2.250	2.494	**9.780**
5	1.800	1.710	**5.263**	1.800	1.810	**0.552**	3.240	3.095	**4.682**
6	3.300	3.250	**1.538**	8.300	8.170	**1.591**	27.390	26.553	**3.154**
7	3.000	3.100	**3.226**	3.200	3.270	**2.141**	9.600	10.137	**5.297**
8	2.300	2.150	**6.977**	3.500	3.930	**10.941**	8.050	8.450	**4.728**
9	1.800	1.950	**7.692**	1.800	1.880	**4.255**	3.240	3.666	**11.620**
10	3.000	2.950	**1.695**	3.000	2.800	**7.143**	9.000	8.260	**8.959**
11	3.100	3.110	**0.322**	3.100	3.080	**0.649**	9.610	9.579	**0.326**

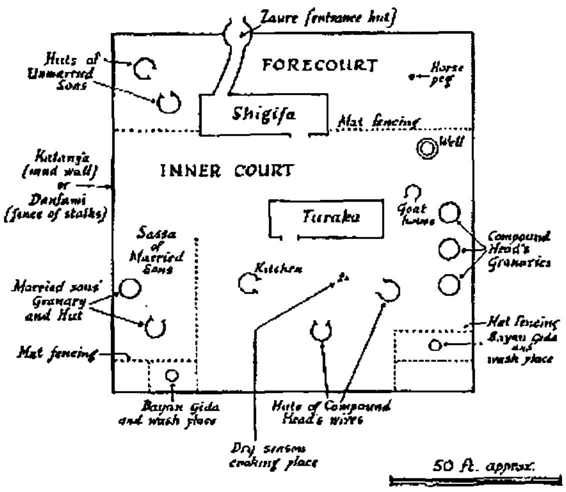
APPENDIX 9e. HOUSE DIMENSIONS ESTIMATE: CONTROL FOR ERROR

No. 9	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error { ABS}
1	4.800	4.750	1.053	3.500	3.520	0.568	16.800	16.720	0.478
2	2.800	2.250	24.444	1.900	2.510	24.303	5.300	5.650	6.195
3	3.600	3.700	2.703	3.100	3.150	1.587	11.20	11.66	3.945
4	2.100	2.100	0.000	2.100	2.280	7.895	4.400	4.790	8.142
5	5.500	5.450	0.917	2.900	2.890	0.346	15.900	15.750	9.524
6	2.100	2.100	0.000	2.100	2.020	3.960	4.400	4.240	3.773
7	1.500	1.610	6.832	2.800	2.650	5.660	4.200	4.270	1.634
8	2.700	2.660	1.504	3.000	3.100	3.226	8.100	8.250	1.771
9	3.500	3.360	4.167	2.600	2.740	5.109	9.100	9.200	1.156
10	1.400	1.380	1.449	2.900	3.090	6.149	4.060	4.260	4.789

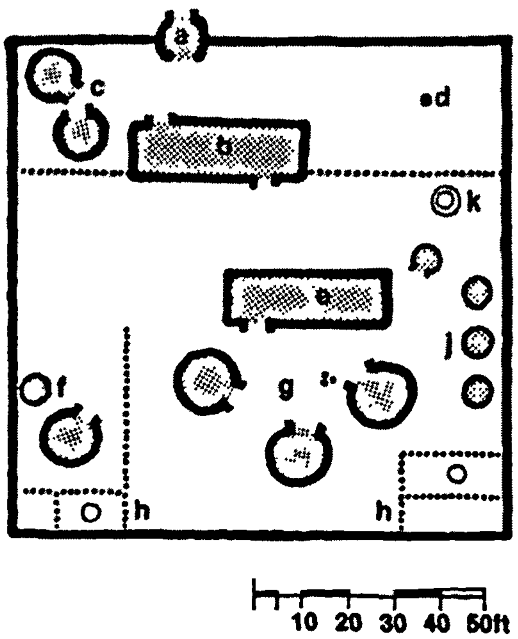
No. 10	LENGTH (Metres)			WIDTH (Metres)			AREA (Square Metres)		
Space	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}	Estimated	Measured	% Error {ABS}
1	3.300	2.800	17.857	2.700	3.000	10.00	8.100	8.400	3.686
2	3.000	2.900	3.448	3.000	3.300	9.091	9.000	9.600	6.250
3	1.500	1.400	7.130	2.300	2.400	4.167	3.450	3.380	2.071
4	2.500	2.450	2.041	2.500	2.540	1.575	6.250	6.240	0.160
5	2.200	2.300	4.348	3.000	2.970	1.010	6.600	6.840	3.509
6	4.500	4.350	3.448	3.500	3.690	5.149	16.750	15.060	11.222
7	10.750	11.100	3.153	7.000	6.500	7.692	7.500	7.270	3.436
8	3.000	2.900	3.448	2.000	2.080	3.846	6.000	6.040	0.662
9	3.000	2.900	3.448	3.000	3.100	3.226	9.000	9.010	0.111
10	3.000	2.900	3.448	2.800	3.000	6.667	8.400	8.700	3.448
11	3.000	2.850	5.263	3.000	3.550	15.493	9.000	10.130	11.155
12	2.700	2.650	1.887	3.000	3.120	5.769	8.910	8.270	7.739



BEGUIN 1952 : FERME MOUNDANG



SMITH 1954 : HAUSA COMPOUND (GIDA)



PRUSSIN 1986 : A HAUSA GIDA AT KANO

APPENDIX 10 : MOUNDANG FERME AND HAUSA HOUSE

APPENDIX 11 (a) : FUSKAR KUDU { SOUTH SECTOR } SPACE ACTIVITY RESPONSE

No.	Activity Gender Unit	Reception Male.	 Fem.	Living Male.	 Fem.	 Child	Eating Male.	 Fem.	 Child	Sleeping Male.	 Fem.	 Child
1	ALF-1	A E	E A	D C	C D	- -	D D	D D	E E	E E	E E	E E
2	ALF-2	A D	D A	A D	D D	C C	D D	D E	E E	E E	E E	E E
3	ALF-3	E D	D E	E D	D A	C/D C/D	D D	D E	D E	E E	E E	E E
4	ALF-4	D C/D	E A/D	D D	D A	B C	E D	D A/D	B B	E E	E E	A B
5	ALF-5	B E	E A	A D	C E	A CA	A D	E A/E	D E	E E	E E	E E
6	ALF-6	A C/D	E A	A C/D	C/D A	C A	A C/D	D A	A A/D	A/E D/E	D/E E	A/E A/E
7	ALF-7	A E	E A	A C/D	C/D A	D D	A/D C/D	D A/D	D C	A/E D/E	D/E E	A/E A/E
8	ALF-8	A E	D/E A	A/D C/D	C/D A	C C/E	A/E C/D	D A/E	C C/E	E D/E	C/E E	C/D C/E
9	SDK-1	A D	D A	A D	A/D A/E	A A/C	A D	D A/E	C C/D	A/E E	C/E E	A C/D
10	SDK-2	A E	D A	A/E E	E A/E	C C	E E	E E	D C/D	E E	E E	D C/D
11	SDK-3	A D/E	E A	A/E C/D	C/D A	C/E C	A E	E A	E E	E E	E E	E E
12	SDK-4	A E	E A	A C/E	E E	C E	E E	E E	E E	A/E C/E	E E	A E
13	SDK-5	A E	C/E A	A C/E	C/E A	A C	A E	E A	A/C C	A E	E E	A/C C/E
14	SDK-6	A E	E A	A C/E	C A	C C	E E	C A	E C	E E	C/E E	E E
15	SDK-7	A E	E A	E E	C A	C C	B E	E B	B/E C	A/E E	B/E B/E	E E
16	SDK-8	A D	D A	A D	C/D A	D C	A D	D A/E	A A	E E	C/E E	C/D D
17	SHS-1	A E	E A	D C/D	C D	C/D C	E C/E	E E	C/E E	D/E E	E E	E E
18	SHS-2	A D	D A	A D	D D	C/D D	A/E D	D D	C/D E	D/E D/E	C/E D/E	C/D C/D
19	SHS-3	A/E -	-	A/E -	-	-	A/E -	-	-	A/E -	-	-
20	SHS-4	A/B C/D	D/E A/B	B C/D	C/D B/E	-	B D	D B/E	-	B/D E	E E	-
21	SHS-5	A C/E	E A	A/E C/D	C/D E	B B	A/E C/D	D E	C C/E	E E	D/E E	A/E A/B

APPENDIX 11(b) : FUSKAR KUDU { SOUTH SECTOR } SPACE ACTIVITY RESPONSE

No.	Activity Gender	Reception		Living			Eating			Sleeping		
	Unit	Male.	Fem.	Male.	Fem.	Child	Male.	Fem.	Child	Male.	Fem.	Child
22	UGN-1	A E	E A	A C/E	C/E D	A/C A/C	A C/E	C A/E	A A	D/E E	C/E A/E	A A
23	UGN-2	A D/E	D/E A	E C/E	D/E D/E	C/E D/E	D/E D/E	D/E D/E	C/E D/E	D/E D/E	D/E D/E	C/E D/E
24	UGN-3	A C/E	C/E A	A/E C/E	C/E A/E	A/E C/E	A/E C/E	E A/E	A/C A/C	D/E D/E	E A/E	A/E A/E
25	UGN-4	A E	E A	A/E C/E	C A	C C/E	E C	C/E A/E	C E	E E	C/E A/E	A E
26	UGN-5	A E	E A	A/E E	C/E A/E	C A/C	A E	C A	C A	A/E E	C/E E	C/E C/E
27	UGN-6	A E	D A	- E	C/D A	C/D C	A C/E	D/E A	C/E C	E E	D/E E	E E
28	UGN-7	A E	E A	E C/E	E E	C E	E E	E E	C E	E E	E E	E E
29	UGN-8	A E	E A	E C/E	C/E E	A/E A/E	E E	E E	C/E E	E E	E E	A/E A/E
30	YKS-1	A D	D A	D D	D D	C/E D	E E	D D	C D	E E	D/E D/E	E A/E
31	YKS-2	A E	E A	E C/E	A/C A	C A/C	A/E E	E A/E	C/E A/C	E E	E A/E	E E
32	YKS-3	A E	E A	A E	C E	A E	A E	E E	A E	E E	E E	E E
33	YKS-4	A E	E A	E E	C/E A	C C	E E	E A	C E	E E	E A/E	E E
34	YKS-5	A E	E A	A/E C	C A	C C	E E	C A	C C	E E	C/E E	E E
35	ZNG-1	A D/E	E A	A D	C/D E	A C/E	A C	C A	C C	E E	E E	A/E C/E
36	ZNG-2	A D	D/E A	A C	D/E A	C C	E C/E	D A	D D	E D/E	E E	E E
37	ZNG-3	E D/C	D A	E C	B A	A A	B/E C/D	E A	B B	E E	C/E E	B/E E
38	ZNG-4	A D	D A	E D	C E	C C	A/E D	C/D D/E	D C	A/E D/E	D/E D/E	E E
39	ZNG-5	A D	E A	A D	D A	C A	A D	D A/E	C D	E C/E	D E	E E
40	ZNG-6	A D	D A	D/E C/D	D A	- -	D D	D A	- -	E E	D D/E	- -
	A	35 / -	-/37	19/-	1/21	7.5/6	16/-	-/16.5	5/4.5	5/-	-/2.5	7.5/3.5
	B	1.5 /-	-/ 0.5	1/-	1/0.5	2/1	2.5/-	-/1.5	3.5/2	0.5/-	-/0.5	1.5/2.5
	C	- /3	1/ -	-/12.5	17/-	20/19	-/7	6 /-	15/11	0.5/0.5	5/-	3/3.5
	D	1/13.5	13/O.5	13/18.5	13.5/6.5	4/4	5/15	17.5/5	6.5/5	3/3.5	5.5/2.5	2.5/4
	E	3.5/22.5	25/1	5.5/3.5	7/11	2.5/6	16.5/17	15.5/16	8/14.5	31.5/36.5	28.5/33.5	22.5/23.5
	X	- / 1	1/1	1/1	1/1	4/4	-/1	1/1	3/3		1/1	3/3

KEY

A. Outside Activity Space { *Zaure*; *Soro*; *Shago* etc.}
B. Outer Activity Space { *Kofar Gida*; *Turaka* etc. }
C. Inside Open Space { *Tsakar Gida* }
D. Inner Hall { *Rumfa* }
E. *'Daki* or Room
X. No Response

NB

The response A / B under Reception {male} means, that when questioned about Reception, the male answer is, males receive in space A and females in space B.

Similarly , the response C / E under Reception {female} means, that when questioned about Reception, the female answer is , females receive in space C and males in space E.

The response C/D indicates that an activity takes place in both places.

APPENDIX 12a : Alphabetical Order Of Integration

Serial	Order Type	Count	Unit	House No	City Sector	Ethnicity	Occupation
1	ABCDOsE	1	TNF-3	70	E	Other	Crafts
2	ACBEDOs	1	SDK -3	85	S	Fulani	Crafts
3	ACDEBOs		BRW-2	55	W	Hausa	Other
4	ACDEBOs	2	LMK 3	79	W	Hausa	Smithing
5	ACDEOs		DNL-1	3	N	North	Trading
6	ACDEOs	2	SHS -4	95	S	Fulani	Trading
7	ACDOsE	1	DNL-4	74	N	North	Trading
8	ACOs=DE	1	DKR -4	89	N	Kanuri	Smithing
9	ACOsDE		SRF -3	122	E	North	Other
10	ACOsDE	2	JNG -1	150	W	North	Crafts
11	ADBCEOs	1	ALF -4	82	S	North	Other
12	ADCEOs	1	ALF -5	27	S	North	Other
13	AOsCE	1	YKS -5	137	S	Fulani	Trading
14	BACDEOs		ZNG -3	155	S	Other	Smithing
15	BACDEOs	3	SDK -7	129	S	Fulani	Crafts
16	BACDEOs		MDB 1	83	N	Hausa	Other
17	BACDOs	1	ZBR-4	128	E	Kanuri	Trading
18	BACEOs	1	SRF -2	121	E	North	Other
19	BACOsDE		DAL-2	131	N	Hausa	Smithing
20	BACOsDE		KMG-2	159	E	Fulani	Smithing
21	BACOsDE	4	YKS -3	130	S	Fulani	Trading
22	BACOsDE		TNF-5	94	E	Other	Crafts
23	BAOsCDE	1	DBZ -2	153	E	Fulani	Crafts
24	BCADEOs		KMG-1	152	E	Fulani	Smithing
25	BCADEOs		TMK-4	113	N	North	Smithing
26	BCADEOs		WRR-5	151	W	Fulani	Smithing
27	BCADEOs	7	DRM-4	2	E	Other	Other
28	BCADEOs		DRM-1	148	E	Other	Other
29	BCADEOs		SMN 4	69	W	Other	Other
30	BCADEOs		SDK -1	24	S	Fulani	Crafts
31	BCADOsE	1	MDB-4	156	N	Hausa	Other
32	BCAEOs		LMK 1	132	W	Hausa	Smithing
33	BCAEOs	2	SDK -4	145	S	Fulani	Crafts
34	BCDAEOs	1	ADK -4	146	N	Hausa	Crafts
35	BDACEOs		DRM 2	21	E	Other	Other
36	BDACEOs	2	DAR -4	87	E	Hausa	Trading
37	BDCAEOs	1	JNG -4	154	W	North	Crafts
38	BOsACDE		DIS-1	160	W	Kanuri	Smithing
39	BOsACDE	2	DIS-3	157	W	Kanuri	Smithing
40	C=ADEOs	1	JNG -3	149	W	North	Crafts
41	C=BA=DEOs	1	KMG-4	8	E	Fulani	Smithing
42	C=DAEOs	1	SHS -2	17	S	Fulani	Trading
43	CA=EOs	1	UGN -7	11	S	Other	Crafts
44	CABDEOs		YKS -1	73	S	Fulani	Trading
45	CABDEOs	2	JNG -2	93	W	North	Crafts
46	CADBEOs	1	ADK -3	18	N	Hausa	Crafts
47	CADEBOs	1	TNF-4	48	E	Other	Crafts
48	CADEOs		ALF -1	35	S	North	Other
49	CADEOs		LMK 2	68	W	Hausa	Smithing
50	CADEOs		KMG-5	117	E	Fulani	Smithing
51	CADEOs		ADK -2	90	N	Hausa	Crafts
52	CADEOs		UGN -2	103	S	Other	Crafts
53	CADEOs		KOK -3	45	E	Hausa	Trading
54	CADEOs		JNG -5	138	W	North	Crafts
55	CADEOs		LMK 5	57	W	Hausa	Smithing
56	CADEOs		MGN-5	59	E	Kanuri	Other
57	CADEOs		MGN-3	16	E	Kanuri	Other
58	CADEOs		ALF -8	147	S	North	Other
59	CADEOs		SHS -3	1	S	Fulani	Trading
60	CADEOs	25	ALF -6	63	S	North	Other

APPENDIX 12b : Alphabetical Order Of Integration

Serial	Order Type	Count	Unit	House No	City Sector	Ethnicity	Occupation
61	CADEOs		CDY- 4	114	N	North	Crafts
62	CADEOs		BRW-1	126	W	Hausa	Other
63	CADEOs		ZBR-1	108	E	Kanuri	Trading
64	CADEOs		ZNG -5	34	S	Other	Smithing
65	CADEOs		DNL-5	127	N	North	Trading
66	CADEOs		BZW -1	50	E	Kanuri	Crafts
67	CADEOs		WRR-2	123	W	Fulani	Smithing
68	CADEOs		DKR -5	52	N	Kanuri	Smithing
69	CADEOs		DAR -1	134	E	Hausa	Trading
70	CADEOs		DBZ -1	139	E	Fulani	Crafts
71	CADEOs		UGN -6	125	S	Other	Crafts
72	CADEOs		DNL-2	36	N	North	Trading
73	CADOs=E	1	DBZ -3	20	E	Fulani	Crafts
74	CADOsE		DKR -2	142	N	Kanuri	Smithing
75	CADOsE		MGN-4	91	E	Kanuri	Other
76	CADOsE		TMK-2	40	N	North	Smithing
77	CADOsE		ALF -2	61	S	North	Other
78	CADOsE	8	ZBR-3	78	E	Kanuri	Trading
79	CADOsE		SMN 5	92	W	Other	Other
80	CADOsE		YKS -4	105	S	Fulani	Trading
81	CADOsE		ZNG -1	133	S	Other	Smithing
82	CAEOs		DIS-5	23	W	Kanuri	Smithing
83	CAEOs		YKS -2	119	S	Fulani	Trading
84	CAEOs		ADK -1	7	N	Hausa	Crafts
85	CAEOs		GBR -3	31	E	Hausa	Crafts
86	CAEOs		GBR -2	30	E	Hausa	Crafts
87	CAEOs		UGN -5	41	S	Other	Crafts
88	CAEOs	12	UGN -8	136	S	Other	Crafts
89	CAEOs		DAR -2	110	E	Hausa	Trading
90	CAEOs		BZW -4	4	E	Kanuri	Crafts
91	CAEOs		DAL-1	13	N	Hausa	Smithing
92	CAEOs		DAL-3	112	N	Hausa	Smithing
93	CAEOs		TNF-1	141	E	Other	Crafts
94	CAOsDE		KOK -1	101	E	Hausa	Trading
95	CAOsDE	2	KOK -2	102	E	Hausa	Trading
96	CAOsED	1	DIS-2	75	W	Kanuri	Smithing
97	CB=DAEOs	1	WRR-3	115	W	Fulani	Smithing
98	CBADEOs		ZNG -4	71	S	Other	Smithing
99	CBADEOs	2	DBZ -5	124	E	Fulani	Crafts
100	CBAEDOs	1	SDK -6	72	S	Fulani	Crafts
101	CBAOs=E	1	SDK -5	99	S	Fulani	Crafts
102	CBDAEOs		ADK -5	143	N	Hausa	Crafts
103	CBDAEOs		WRR-1	42	W	Fulani	Smithing
104	CBDAEOs		SMN 2	47	W	Other	Other
105	CBDAEOs		BZW -2	67	E	Hausa	Smithing
106	CBDAEOs	8	SMN 1	77	W	Other	Other
107	CBDAEOs		MDB-3	53	N	Hausa	Other
108	CBDAEOs		KOK -4	32	E	Hausa	Trading
109	CBDAEOs		DNL-3	29	N	North	Trading
110	CBDEAOs	1	KMG-3	38	E	Fulani	Smithing
111	CBEAOs	1	DRM 3	109	E	Other	Other
112	CD=AEOs		WRR-4	43	W	Fulani	Smithing
113	CD=AEOs	2	CDY- 2	28	N	North	Crafts
114	CDA=EOs	1	GBR -5	37	E	Hausa	Crafts
115	CDABEOs		ZNG -2	144	S	Other	Smithing
116	CDABEOs	2	SHS -5	81	S	Fulani	Trading
117	CDAE=Os	1	TMK-5	118	N	North	Smithing
118	CDAEB=Os	1	BZW -5	44	E	Kanuri	Crafts
119	CDAEBOs	1	TNF-2	84	E	Other	Crafts

APPENDIX 12c : Alphabetical Order Of Integration

Serial	Order Type	Count	Unit	House No	City Sector	Ethnicity	Occupation
121	CDAEOs		DAR -3	76	E	Hausa	Trading
122	CDAEOs		DKR -1	96	N	Kanuri	Smithing
123	CDAEOs		DKR -3	140	N	Kanuri	Smithing
124	CDAEOs		DRM-5	22	E	Other	Other
125	CDAEOs		ZNG -6	26	S	Other	Smithing
126	CDAEOs		CDY- 3	51	N	North	Crafts
127	CDAEOs		ZBR-2	62	E	Kanuri	Trading
128	CDAEOs		ZBR-5	116	E	Kanuri	Trading
129	CDAEOs		CDY- 1	111	N	North	Crafts
130	CDAEOs		DBZ -4	135	E	Fulani	Crafts
131	CDAEOs		BZW -3	12	E	Kanuri	Crafts
132	CDAEOs		DAL-5	15	N	Hausa	Smithing
133	CDAEOs		CDY- 5	120	N	North	Crafts
134	CDAEOs		DAL-4	14	N	Kanuri	Crafts
135	CDAEOs	31	MDB-2	58	N	Hausa	Other
136	CDAEOs		MDB-5	104	N	Hausa	Other
137	CDAEOs		LMK 4	107	W	Hausa	Smithing
138	CDAEOs		TMK-1	9	N	North	Smithing
139	CDAEOs		SDK -8	5	S	Fulani	Crafts
140	CDAEOs		SDK -2	60	S	Fulani	Crafts
141	CDAEOs		ALF -7	19	S	North	Other
142	CDAEOs		SRF -1	33	E	North	Other
143	CDAEOs		SRF -4	39	E	North	Other
144	CDAEOs		SHS -1	80	S	Fulani	Trading
145	CDAEOs		SRF -5	6	E	North	Other
146	CDAEOs		UGN -3	49	S	Other	Crafts
147	CDAEOs		BRW-5	106	W	Hausa	Other
148	CDAEOs		BRW-4	65	W	Hausa	Other
149	CDAEOs		UGN -1	54	S	Other	Crafts
150	CDAEOs		TMK-3	10	N	North	Smithing
151	CDAOsE	1	DAR -5	97	E	Hausa	Trading
152	CDBAEOs		DIS-4	66	W	Kanuri	Smithing
153	CDBAEOs	2	KOK -5	158	E	Hausa	Trading
154	CDOsE=A	1	MGN-2	88	E	Kanuri	Other
155	CEAOs	1	UGN -4	25	S	Other	Crafts
156	CEOsA	1	SMN 3	86	W	Other	Other
157	COsDAE	1	GBR -1	98	E	Hausa	Crafts
158	DACEOs	1	MGN-1	46	E	Kanuri	Other
159	DCAEOs	1	BRW-3	64	W	Hausa	Other
160	DCEAOs	1	ALF -3	100	S	North	Other

Appendix 13a: Unit House Order Of Integration

Serial	Unit House	House No	Main Functional Space Order Of Integration	Family	Population	Income Group	Sector Location	Ethnicity	Occupation	Asymmetry
1	ADK -1	7	COURT>ZAURE>DAKI>Ex	one	4	C	N	Hausa	Crafts	Tree
2	ADK -2	90	COURT>ZAURE>RUMFA>DAKI>Ex	one	15	C	N	Hausa	Crafts	Ring
3	ADK -3	18	COURT>ZAURE>RUMFA>K/GIDA>DAKI>Ex	one	5	C	N	Hausa	Crafts	Tree
4	ADK -4	146	K/GIDA>COURT>RUMFA>ZAURE>DAKI>Ex	four	38	B	N	Hausa	Crafts	Tree
5	ADK -5	143	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	four	20	C	N	Hausa	Crafts	Tree
6	ALF -1	35	COURT>ZAURE>RUMFA>DAKI>Ex	one	7	C	S	Nor. Afr.	Other	Tree
7	ALF -2	61	COURT>ZAURE>RUMFA>Ex>DAKI	one	7	B	S	Nor. Afr.	Other	Tree
8	ALF -3	100	RUMFA>COURT>DAKI>ZAURE>Ex	one	7	C	S	Nor. Afr.	Other	Ring
9	ALF -4	82	ZAURE>RUMFA>K/GIDA>COURT>DAKI>Ex	one	15	B	S	Nor. Afr.	Other	Tree
10	ALF -5	27	ZAURE>RUMFA>COURT>DAKI>Ex	one	10	C	S	Nor. Afr.	Other	Tree
11	ALF -6	63	COURT>ZAURE>RUMFA>DAKI>Ex	one	10	C	S	Nor. Afr.	Other	Tree
12	ALF -7	19	COURT>RUMFA>ZAURE>DAKI>Ex	one	18	C	S	Nor. Afr.	Other	Tree
13	ALF -8	147	COURT>ZAURE>RUMFA>DAKI>Ex	four	22	C	S	Nor. Afr.	Other	Tree
14	BRW -1	126	COURT>ZAURE>RUMFA>DAKI>Ex	two	16	C	W	Hausa	Other	Tree
15	BRW -2	55	ZAURE>COURT>RUMFA>DAKI>K/GIDA>Ex	one	7	C	W	Hausa	Other	Tree
16	BRW -3	64	RUMFA>COURT>ZAURE>DAKI>Ex	one	4	B	W	Hausa	Other	Tree
17	BRW -4	65	COURT>RUMFA>ZAURE>DAKI>Ex	one	13	B	W	Hausa	Other	Tree
18	BRW -5	106	COURT>RUMFA>ZAURE>DAKI>Ex	two	10	C	W	Hausa	Other	Tree
19	BZW -1	50	COURT>ZAURE>RUMFA>DAKI>Ex	one	7	B	E	Kanuri	Crafts	Tree
20	BZW -3	12	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	C	E	Kanuri	Crafts	Tree
21	BZW -2	67	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	6	C	E	Hausa	Smithing	Tree
22	BZW -4	4	COURT>ZAURE>DAKI>Ex	one	5	B	E	Kanuri	Crafts	Tree
23	BZW -5	44	COURT>RUMFA>ZAURE>DAKI>K/GIDA=Ex	one	13	C	E	Kanuri	Crafts	Tree
24	CDY- 1	111	COURT>RUMFA>ZAURE>DAKI>Ex	two	7	C	N	Nor. Afr.	Crafts	Tree
25	CDY- 2	28	COURT>RUMFA=ZAURE>DAKI>Ex	one	12	C	N	Nor. Afr.	Crafts	Tree
26	CDY- 3	51	COURT>RUMFA>ZAURE>DAKI>Ex	one	20	C	N	Nor. Afr.	Crafts	Tree
27	CDY- 4	114	COURT>ZAURE>RUMFA>DAKI>Ex	two	17	B	N	Nor. Afr.	Crafts	Tree
28	CDY- 5	120	COURT>RUMFA>ZAURE>DAKI>Ex	two	17	C	N	Nor. Afr.	Crafts	Tree
29	DAL-1	13	COURT>ZAURE>DAKI>Ex	one	7	C	N	Hausa	Smithing	Tree
30	DAL-2	131	K/GIDA>ZAURE>COURT>Ex>RUMFA>DAKI	two	8	B	N	Hausa	Smithing	Tree
31	DAL-3	112	COURT>ZAURE>DAKI>Ex	two	17	C	N	Hausa	Smithing	Tree
32	DAL-4	14	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	B	N	Kanuri	Crafts	Tree
33	DAL-5	15	COURT>RUMFA>ZAURE>DAKI>Ex	one	8	C	N	Hausa	Smithing	Tree

Appendix 13b: Unit House Order Of Integration

Serial	Unit House	House No	Main Functional Space Order Of Integration	Family	Population	Income Group	Sector Location	Ethnicity	Occupation	Asymmetry
34	DBZ -1	139	COURT>ZAURE>RUMFA>DAKI>Ex	three	9	B	E	Fulani	Crafts	Tree
35	DBZ -2	153	K/GIDA>ZAURE>Ex>COURT>RUMFA>DAKI	five	24	C	E	Fulani	Crafts	Tree
36	DBZ -3	20	COURT>ZAURE>RUMFA>Ex=DAKI	one	4	C	E	Fulani	Crafts	Tree
37	DBZ -4	135	COURT>RUMFA>ZAURE>DAKI>Ex	three	12	B	E	Fulani	Crafts	Tree
38	DBZ -5	124	COURT>K/GIDA>ZAURE>RUMFA>DAKI>Ex	two	15	C	E	Fulani	Crafts	Tree
39	DNL-1	3	ZAURE>COURT>RUMFA>DAKI>Ex	**none**	3	C	N	Nor. Afr.	Trading	Tree
40	DNL-2	36	COURT>ZAURE>RUMFA>DAKI>Ex	one	9	C	N	Nor. Afr.	Trading	Tree
41	DNL-3	29	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	7	C	N	Nor. Afr.	Trading	Tree
42	DNL-4	74	ZAURE>COURT>RUMFA>Ex>DAKI	one	12	B	N	Nor. Afr.	Trading	Tree
43	DNL-5	127	COURT>ZAURE>RUMFA>DAKI>Ex	two	11	B	N	Nor. Afr.	Trading	Tree
44	DRM -1	148	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	four	29	C	E	Other	Other	Tree
45	DRM -2	21	K/GIDA>RUMFA>ZAURE>COURT>DAKI>Ex	one	7	B	E	Other	Other	Tree
46	DRM -3	109	COURT>K/GIDA>DAKI>ZAURE>Ex	two	10	B	E	Other	Other	Tree
47	DRM -4	2	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	**none**	1	B	E	Other	Other	Tree
48	DRM -5	22	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	A	E	Other	Other	Tree
49	DIS-1	160	K/GIDA>Ex>ZAURE>COURT>RUMFA>DAKI	eight	58	C	W	Kanuri	Smithing	Ring
50	DIS-2	75	COURT>ZAURE>Ex>DAKI>RUMFA	one	9	B	W	Kanuri	Smithing	Tree
51	DIS-3	157	K/GIDA>Ex>ZAURE>COURT>RUMFA>DAKI	eight	56	C	W	Kanuri	Smithing	Tree
52	DIS-4	66	COURT>RUMFA>K/GIDA>ZAURE>DAKI>Ex	one	5	C	W	Kanuri	Smithing	Tree
53	DIS-5	23	COURT>ZAURE>DAKI>Ex	one	11	C	W	Kanuri	Smithing	Tree
54	DKR -1	96	COURT>RUMFA>ZAURE>DAKI>Ex	one	9	C	N	Kanuri	Smithing	Ring
55	DKR -2	142	COURT>ZAURE>RUMFA>Ex>DAKI	three	18	C	N	Kanuri	Smithing	Ring
56	DKR -3	140	COURT>RUMFA>ZAURE>DAKI>Ex	three	14	C	N	Kanuri	Smithing	Tree
57	DKR -4	89	ZAURE>COURT>Ex=RUMFA>DAKI	one	6	C	N	Kanuri	Smithing	Ring
58	DKR -5	52	COURT>ZAURE>RUMFA>DAKI>Ex	one	15	C	N	Kanuri	Smithing	Tree
59	DAR -1	134	COURT>ZAURE>RUMFA>DAKI>Ex	two	10	C	E	Hausa	Trading	Ring
60	DAR -2	110	COURT>ZAURE>DAKI>Ex	two	8	B	E	Hausa	Trading	Tree
61	DAR -3	76	COURT>RUMFA>ZAURE>DAKI>Ex	one	11	B	E	Hausa	Trading	Tree
62	DAR -4	87	K/GIDA>RUMFA>ZAURE>COURT>DAKI>Ex	one	10	B	E	Hausa	Trading	Ring
63	DAR -5	97	COURT>RUMFA>ZAURE>Ex>DAKI	one	17	A	E	Hausa	Trading	Ring
64	GBR -1	98	COURT>Ex>RUMFA>ZAURE>DAKI	one	12	A	E	Hausa	Crafts	Ring
65	GBR -2	30	COURT>ZAURE>DAKI>Ex	one	10	C	E	Hausa	Crafts	Tree
66	GBR -3	31	COURT>ZAURE>DAKI>Ex	one	7	C	E	Hausa	Crafts	Tree
67	GBR -4	56	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	B	E	Hausa	Crafts	Tree
68	GBR -5	37	COURT>RUMFA>ZAURE=DAKI>Ex>	one	13	B	E	Hausa	Crafts	Tree

Appendix 13c: Unit House Order Of Integration

Serial	Unit House	House No	Main Functional Space Order Of Integration	Family	Population	Income Group	Sector Location	Ethnicity	Occupation	Asymmetry
69	JNG -1	150	ZAURE>COURT>Ex>RUMFA>DAKI	four	37	C	W	Nor. Afr.	Crafts	Tree
70	JNG -2	93	COURT>ZAURE>K/GIDA>RUMFA>DAKI>Ex	one	12	C	W	Nor. Afr.	Crafts	Ring
71	JNG -3	149	COURT=ZAURE>RUMFA>DAKI>Ex	four	30	C	W	Nor. Afr.	Crafts	Tree
72	JNG -4	154	K/GIDA>RUMFA>COURT>ZAURE>DAKI>Ex	seven	51	C	W	Nor. Afr.	Crafts	Tree
73	JNG -5	138	COURT>ZAURE>RUMFA>DAKI>Ex	three	12	B	W	Nor. Afr.	Crafts	Tree
74	KOK -1	101	COURT>ZAURE>Ex>RUMFA>DAKI	one	13	A	E	Hausa	Trading	Ring
75	KOK -2	102	COURT>ZAURE>Ex>RUMFA>DAKI	one	16	B	E	Hausa	Trading	Ring
76	KOK -3	45	COURT>ZAURE>RUMFA>DAKI>Ex	one	7	B	E	Hausa	Trading	Tree
77	KOK -4	32	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	6	B	E	Hausa	Trading	Tree
78	KOK -5	158	COURT>RUMFA>K/GIDA>ZAURE>DAKI>Ex	eight	45	C	E	Hausa	Trading	Ring
79	KMG-1	152	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	five	34	C	E	Fulani	Smithing	Tree
80	KMG-2	159	K/GIDA>ZAURE>COURT>Ex>RUMFA>DAKI	eight	47	C	E	Fulani	Smithing	Ring
81	KMG-3	38	COURT>K/GIDA>RUMFA>DAKI>ZAURE>Ex	one	11	C	E	Fulani	Smithing	Tree
82	KMG-4	8	COURT=K/GIDA>ZAURE>=RUMFA>DAKI>Ex	one	6	B	E	Fulani	Smithing	Tree
83	KMG-5	117	COURT>ZAURE>RUMFA>DAKI>Ex	two	13	B	E	Fulani	Smithing	Tree
84	LMK - 1	132	K/GIDA>COURT>ZAURE>DAKI>Ex	two	16	C	W	Hausa	Smithing	Ring
85	LMK - 2	68	COURT>ZAURE>RUMFA>DAKI>Ex	one	12	C	W	Hausa	Smithing	Tree
86	LMK - 3	79	ZAURE>COURT>RUMFA>DAKI>K/GIDA>Ex	one	6	C	W	Hausa	Smithing	Tree
87	LMK - 4	107	COURT>RUMFA>ZAURE>DAKI>Ex	two	4	C	W	Hausa	Smithing	Tree
88	LMK - 5	57	COURT>ZAURE>RUMFA>DAKI>Ex	one	11	C	W	Hausa	Smithing	Tree
89	MDB -1	83	K/GIDA>ZAURE>COURT>RUMFA>DAKI>Ex	one	33	C	N	Hausa	Other	Tree
90	MDB -2	58	COURT>RUMFA>ZAURE>DAKI>Ex	one	19	C	N	Hausa	Other	Tree
91	MDB -3	53	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	9	C	N	Hausa	Other	Tree
92	MDB -4	156	K/GIDA>COURT>ZAURE>RUMFA>Ex>DAKI	eight	62	C	N	Hausa	Other	Ring
93	MDB -5	104	COURT>RUMFA>ZAURE>DAKI>Ex	two	10	C	N	Hausa	Other	Tree
94	MGN-1	46	RUMFA>ZAURE>COURT>DAKI>Ex	one	6	B	E	Kanuri	Other	Tree
95	MGN-2	88	COURT>RUMFA>Ex>DAKI=ZAURE	one	5	C	E	Kanuri	Other	Ring
96	MGN-3	16	COURT>ZAURE>RUMFA>DAKI>Ex	one	5	B	E	Kanuri	Other	Tree
97	MGN-4	91	COURT>ZAURE>RUMFA>Ex>DAKI	one	11	C	E	Kanuri	Other	Ring
98	MGN-5	59	COURT>ZAURE>RUMFA>DAKI>Ex	one	12	B	E	Kanuri	Other	Tree
99	SMN - 1	77	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	13	C	W	Other	Other	Tree
100	SMN - 2	47	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	8	C	W	Other	Other	Tree
101	SMN - 3	86	COURT>DAKI>Ex>ZAURE	one	5	C	W	Other	Other	Ring
102	SMN - 4	69	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	one	10	C	W	Other	Other	Tree
103	SMN - 5	92	COURT>ZAURE>RUMFA>Ex>DAKI	one	12	C	W	Other	Other	Ring

Appendix 13d: Unit House Order Of Integration

Serial	Unit House	House No	Main Functional Space Order Of Integration	Family	Population	Income Group	Sector Location	Ethnicity	Occupation	Asymmetry
104	SRF -1	33	COURT>RUMFA>ZAURE>DAKI>Ex	one	5	C	E	Nor. Afr.	Other	Tree
105	SRF -2	121	K/GIDA>ZAURE>COURT>DAKI>Ex	two	10	C	E	Nor. Afr.	Other	Tree
106	SRF -3	122	ZAURE>COURT>Ex>RUMFA>DAKI	two	14	C	E	Nor. Afr.	Other	Tree
107	SRF -4	39	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	B	E	Nor. Afr.	Other	Tree
108	SRF -5	6	COURT>RUMFA>ZAURE>DAKI>Ex	one	5	B	E	Nor. Afr.	Other	Tree
109	SHS -1	80	COURT>RUMFA>ZAURE>DAKI>Ex	one	6	C	S	Fulani	Trading	Tree
110	SHS -2	17	COURT=RUMFA>ZAURE>DAKI>Ex	one	4	C	S	Fulani	Trading	Tree
111	SHS -3	1	COURT>ZAURE>RUMFA>DAKI>Ex	none	3	C	S	Fulani	Trading	Tree
112	SHS -4	95	ZAURE>COURT>RUMFA>DAKI>Ex	one	5	C	S	Fulani	Trading	Ring
113	SHS -5	81	COURT>RUMFA>ZAURE>K/GIDA>DAKI>Ex	one	21	B	S	Fulani	Trading	Tree
114	SDK -1	24	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	one	4	C	S	Fulani	Crafts	Tree
115	SDK -2	60	COURT>RUMFA>ZAURE>DAKI>Ex	one	9	B	S	Fulani	Crafts	Tree
116	SDK -3	85	ZAURE>COURT>K/GIDA>DAKI>RUMFA>Ex	one	10	C	S	Fulani	Crafts	Tree
117	SDK -4	145	K/GIDA>COURT>ZAURE>DAKI>Ex	four	21	B	S	Fulani	Crafts	Tree
118	SDK -5	99	COURT>K/GIDA>ZAURE>Ex=DAKI	one	19	A	S	Fulani	Crafts	Ring
119	SDK -6	72	COURT>K/GIDA>ZAURE>DAKI>RUMFA>Ex	one	8	C	S	Fulani	Crafts	Tree
120	SDK -7	129	K/GIDA>ZAURE>COURT>RUMFA>DAKI>Ex	two	26	C	S	Fulani	Crafts	Tree
121	SDK -8	5	COURT>RUMFA>ZAURE>DAKI>Ex	one	12	C	S	Fulani	Crafts	Tree
122	TMK-1	9	COURT>RUMFA>ZAURE>DAKI>Ex	one	5	C	N	Nor. Afr.	Smithing	Tree
123	TMK-2	40	COURT>ZAURE>RUMFA>Ex>DAKI	one	11	C	N	Nor. Afr.	Smithing	Tree
124	TMK-3	10	COURT>RUMFA>ZAURE>DAKI>Ex	one	4	C	N	Nor. Afr.	Smithing	Tree
125	TMK-4	113	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	two	11	C	N	Nor. Afr.	Smithing	Tree
126	TMK-5	118	COURT>RUMFA>ZAURE>DAKI=Ex	two	10	C	N	Nor. Afr.	Smithing	Tree
127	TNF-1	141	COURT>ZAURE>DAKI>Ex	three	12	C	E	Other	Crafts	Ring
128	TNF-2	84	COURT>RUMFA>ZAURE>DAKI>K/GIDA>Ex	one	33	C	E	Other	Crafts	Tree
129	TNF-3	70	ZAURE>K/GIDA>COURT>RUMFA>Ex>DAKI	one	13	C	E	Other	Crafts	Tree
130	TNF-4	48	COURT>ZAURE>RUMFA>DAKI>K/GIDA>Ex	one	2	B	E	Other	Crafts	Tree
131	TNF-5	94	K/GIDA>ZAURE>COURT>Ex>RUMFA>DAKI	one	9	B	E	Other	Crafts	Ring

Appendix 13e: Unit House Order Of Integration

Serial	Unit House	House No	Main Functional Space Order Of Integration	Family	Population	Income Group	Sector Location	Ethnicity	Occupation	Asymmetry
132	UGN -1	54	COURT>RUMFA>ZAURE>DAKI>Ex	one	12	B	S	Other	Crafts	Tree
133	UGN -2	103	COURT>ZAURE>RUMFA>DAKI>Ex	one	17	B	S	Other	Crafts	Ring
134	UGN -3	49	COURT>RUMFA>ZAURE>DAKI>Ex	one	8	C	S	Other	Crafts	Tree
135	UGN -4	25	COURT>DAKI>ZAURE>Ex	one	11	C	S	Other	Crafts	Tree
136	UGN -5	41	COURT>ZAURE>DAKI>Ex	one	9	C	S	Other	Crafts	Tree
137	UGN -6	125	COURT>ZAURE>RUMFA>DAKI>Ex	two	17	C	S	Other	Crafts	Tree
138	UGN -7	11	COURT>DAKI=ZAURE>Ex	one	12	B	S	Other	Crafts	Tree
139	UGN -8	136	COURT>ZAURE>DAKI>Ex	three	21	C	S	Other	Crafts	Tree
140	WRR-1	42	COURT>K/GIDA>RUMFA>ZAURE>DAKI>Ex	one	8	C	W	Fulani	Smithing	Tree
141	WRR-2	123	COURT>ZAURE>RUMFA>DAKI>Ex	two	8	C	W	Fulani	Smithing	Tree
142	WRR-3	115	COURT>K/GIDA=RUMFA>ZAURE>DAKI>Ex	two	6	C	W	Fulani	Smithing	Tree
143	WRR-4	43	COURT>RUMFA=ZAURE>DAKI>Ex	one	6	C	W	Fulani	Smithing	Tree
144	WRR-5	151	K/GIDA>COURT>ZAURE>RUMFA>DAKI>Ex	four	37	C	W	Fulani	Smithing	Ring
145	YKS -1	73	COURT>ZAURE>K/GIDA>RUMFA>DAKI>Ex	one	11	B	S	Fulani	Trading	Tree
146	YKS -2	119	COURT>ZAURE>DAKI>Ex	two	18	C	S	Fulani	Trading	Tree
147	YKS -3	130	K/GIDA>ZAURE>COURT>Ex>RUMFA>DAKI	two	20	C	S	Fulani	Trading	Tree
148	YKS -4	105	COURT>ZAURE>RUMFA>Ex>DAKI	two	4	C	S	Fulani	Trading	Tree
149	YKS -5	137	ZAURE>Ex>COURT>DAKI	three	8	C	S	Fulani	Trading	Tree
150	ZNG - 1	133	COURT>ZAURE>RUMFA>Ex>DAKI	two	16	C	S	Other	Smithing	Ring
151	ZNG - 2	144	COURT>RUMFA>ZAURE>K/GIDA>DAKI>Ex	four	35	C	S	Other	Smithing	Tree
152	ZNG - 3	155	K/GIDA>ZAURE>COURT>RUMFA>DAKI>Ex	seven	52	C	S	Other	Smithing	Tree
153	ZNG - 4	71	COURT>K/GIDA>ZAURE>RUMFA>DAKI>Ex	one	10	B	S	Other	Smithing	Tree
154	ZNG - 5	34	COURT>ZAURE>RUMFA>DAKI>Ex	one	10	C	S	Other	Smithing	Tree
155	ZNG - 6	26	COURT>RUMFA>ZAURE>DAKI>Ex	one	2	C	S	Other	Smithing	Tree
156	ZBR-1	108	COURT>ZAURE>RUMFA>DAKI>Ex	two	21	C	E	Kanuri	Trading	Tree
157	ZBR-2	62	COURT>RUMFA>ZAURE>DAKI>Ex	one	7	B	E	Kanuri	Trading	Tree
158	ZBR-3	78	COURT>ZAURE>RUMFA>Ex>DAKI	one	11	B	E	Kanuri	Trading	Tree
159	ZBR-4	128	K/GIDA>ZAURE>COURT>RUMFA>Ex	two	8	C	E	Kanuri	Trading	Tree
160	ZBR-5	116	COURT>RUMFA>ZAURE>DAKI>Ex	two	13	C	E	Kanuri	Trading	Tree

APPENDIX 14 (a) FUSKAR KUDU { SOUTH SECTOR }
SOCIO-ECONOMIC DATA

UNIT	WORK				PERCEPTION					POSSESSION			
	Male	Female &Space			City	Ward	Dwelling		Social Cohesion	I	P/B	G	R
		B	C	D/E			Spat'l	Phys					
ALF-1	•	*	•	•	•	√	•	√	•	√	•	•	•
ALF-2	•	•	•	•	•	√	•	•	•	√	•	•	•
ALF-3	•	•	√	√	•	√	•	•	•	√	•	•	•
ALF-4	•	•	√	•	•	√	•	•	•	√	•	•	•
ALF-5	•	•	•	•	•	√	•	√	•	•	•	•	√
ALF-6	•	•	•	•	√	•	•	√	√	√	•	•	•
ALF-7	•	•	√	•	•	√	√	•	√	√	•	•	•
ALF-8	•	•	√	√	•	√	•	√	•	√	•	•	•
SDK-1	•	•	•	•	•	√	•	•	√	√	•	•	•
SDK-2	•	√	√	•	•	√	√	•	•	•	•	√	•
SDK-3	•	•	•	√	•	√	•	√	•	√	•	•	•
SDK-4	•	•	•	•	•	√	√	•	•	√	•	•	•
SDK-5	•	•	•	•	√	•	•	√	•	√	•	•	•
SDK-6	•	•	√	•	•	√	•	•	•	√	•	•	•
SDK-7	•	•	√	√	•	√	•	•	•	•	√	•	•
SDK-8	•	*	•	•	•	√	•	√	•	√	•	•	•
SHS-1	•	*	•	•	•	√	√	•	•	•	•	√	•
SHS-2	•	√	√	•	•	√	•	√	•	•	•	√	•
SHS-3	•	•	•	√	•	√	•	√	√	√	•	•	•
SHS-4	•	•	•	•	•	√	•	√	•	√	•	•	•
SHS-5	√	√	√	•	•	√	•	√	•	√	•	•	•
UGN-1	•	•	√	√	•	√	•	√	√	•	√	•	•
UGN-2	•	•	•	•	•	√	•	•	•	•	√	•	•
UGN-3	•	•	√	•	•	√	•	√	•	√	•	•	•
UGN-4	•	•	•	•	•	√	•	√	•	•	√	•	•
UGN-5	•	√	√	•	•	√	•	√	√	•	√	•	•
UGN-6	•	•	√	√	•	√	√	•	√	√	•	•	•
UGN-7	•	•	√	•	√	•	√	•	•	•	•	•	√
UGN-8	•	•	•	•	•	√	•	•	√	•	√	•	•
YKS-1	•	•	•	√	•	√	•	√	•	√	•	•	•
YKS-2	•	√	√	•	•	√	•	√	•	•	√	•	•
YKS-3	•	•	•	•	•	√	√	√	√	√	•	•	•
YKS-4	•	•	•	•	•	√	•	•	•	√	•	•	•
YKS-5	•	•	•	•	•	√	•	√	•	√	•	•	•
ZNG-1	•	√	√	•	•	√	•	√	√	√	•	•	•
ZNG-2	•	•	√	√	•	√	•	√	•	√	•	•	•
ZNG-3	√	•	•		•	√	•	•	•	√	•	•	•
ZNG-4	•	•	•	√	√	•	•	√	•	√	•	•	•
ZNG-5	•	√	√	•	√	•	•	√	√	√	•	•	•
ZNG-6	•	√	√	•		√	•	√	•	•	√	•	•
Count	2	11	19	10	5	35	7	24	11	27	8	3	2
% of Sector	5.00	27.5	47.5	25	12.5	87.50	17.50	60	27.50	67.5	20	7.5	5.00
% of Sample	1.25	6.88	11.9	6.25	3.13	21.88	4.38	15	6.88	16.9	5.00	1.9	1.25

APPENDIX 14 (b-1) FUSKAR GABAS { EAST SECTOR }
SOCIO-ECONOMIC DATA

UNIT	WORK				PERCEPTION					POSSESSION			
	Male	Female & Space			City	Ward	Dwelling		Social Cohesion	I	P/B	G	R
		B	C	D/E			Spat'l	Phys					
BZW-1	•	√	√	•	√	•	•	√	√	√	•	•	•
BZW-2	√	√	√	•	√	•	•	√	√	√	•	•	•
BZW-3	•	•	•	√	•	√	•	√	√	√	•	•	•
BZW-4	•	•	√	•	•	*	•	√	•	√	•	•	•
BZW-5	•	•	√	•	√	•	•	•	√	√	•	•	•
DBZ-1	•	•	•	√	√	•	√	•	•	•	•	•	√
DBZ-2	•	•	•	√	√	•	•	√	√	√	•	•	•
DBZ-3	•	•	•	•	•	√	•	√	•	•	•	√	•
DBZ-4	√	•	√	•	√	•	•	√	•	√	•	•	•
DBZ-5	•	•	•	√	•	√	√	•	•	√	•	•	•
DRM-1	•	•	√	•	√	•	√	√	•	√	•	•	•
DRM-2	•	•	√	•	•	√	√	•	√	•	√	•	•
DRM-3	•	•	•	•	•	√	√	•	√	√	•	•	•
DRM-4	•	•	•	•	•	√	•	•	•	√	•	•	•
DRM-5	•	•	•	•	•	√	•	√	•	√	•	•	•
DAR-1	√	•	√	•	√	•	•	√	•	√	•	•	•
DAR-2	•	•	√	√	•	*	√	•	•	√	•	•	•
DAR-3	•	•	•	√	√	•	√	√	•	•	•	√	•
DAR-4	•	•	•	•	•	√	√	•	√	√	√	•	•
DAR-5	•	•	•	•	√	•	•	√	√	√	•	•	•
GBR-1	•	•	•	•	•	√	•	•	•	•	√	•	•
GBR-2	•	•	•	•	•	√	√	•	•	•	√	•	•
GBR-3	•	•	√	•	•	√	•	•	•	√	•	•	•
GBR-4	•	√	√	•	•	*	•	√	•	•	*	•	•
GBR-5	•	√	√	•	•	*	√	√	•	√	•	•	•
KOK-1	•	•	•	√	•	√	•	•	•	•	√	•	•
KOK-2	•	•	•	√	•	√	•	•	•	•	√	•	•
KOK-3	•	•	a	√	√	•	•	•	•	√	•	•	•
KOK-4	•	•	√	•	•	√	•	√	•	√	•	•	•
KOK-5	•	•	√	•	√	•	•	√	•	√	•	•	•
Sub Count	3	4	14	9	12	18	10	16	9	21	7	2	1

APPENDIX 14 (b-2) FUSKAR GABAS { EAST SECTOR }
SOCIO-ECONOMIC DATA

UNIT	WORK				PERCEPTION					POSSESSION			
	Male	Female & Space			City	Ward	Dwelling		Social Cohesion	I	P/B	G	R
		B	C	D/E			Spat'l	Phys					
KMG-1	√	•	√	•	√	√	•	•	•	√	•	•	•
KMG-2	√	√	√	•	•	√	•	√	•	√	•	•	•
KMG-3	√	•	•	√	•	√	•	√	•	√	•	•	•
KMG-4	•	•	√	•	•	√	•	√	•	√	•	•	•
KMG-5	•	•	√	•	√	•	•	√	•	√	•	•	•
MGN-1	•	•	•	•	•	√	√	•	√	√	•	•	√
MGN-2	•	•	•	√	•	√	•	√	√	√	•	•	•
MGN-3	•	•	•	√	•	√	•	•	√	•	•	√	•
MGN-4	•	•	•	•	√	•	•	√	√	•	•	√	•
MGN-5	•	•	√	√	•	√	√	√	√	√	•	•	•
SRF -1	•	•	•	√	•	√	√	•	•	√	•	•	•
SRF -2	•	•	√	•	•	√	•	√	√	√	•	•	•
SRF -3	•	•	√	√	√	•	√	√	•	•	•	√	•
SRF -4	•	•	√	•	•	√	•	•	•	•	•	√	•
SRF -5	•	•	•	•	•	√	•	√	√	√	•	•	•
TNF-1	•	•	•	√	√	•	•	√	•	√	•	•	•
TNF-2	•	•	•	√	√	•	√	√	√	√	•	•	•
TNF-3	•	•	√	•	•	√	•	√	•	√	•	•	•
TNF-4	•	•	•	•	•	√	•	√	•	√	•	•	•
TNF-5	•	•	√	√	•	√	•	•	•	√	•	•	•
ZBR-1	•	•	•	√	√	•	•	√	•	√	•	•	•
ZBR-2	•	•	√	•	•	√	•	√	•	•	√	•	•
ZBR-3	•	•	√	•	•	√	•	√	•	√	•	•	•
ZBR-4	•	•	•	•	√	•	•	√	•	√	•	•	•
ZBR-5	•	•	•	√	•	√	•	√	•	√	•	•	•
Total Count	6	5	26	20	20	36	15	35	17	40	8	6	2
% Of Sector	10.9	9.01	47.7	36.4	36.4	65.45	27.27	63.63	30.91	72.7	14.5	10.9	3.64
% Of Sample	3.75	3.13	16.3	12.5	12.5	22.5	9.39	21.88	10.63	25	5.00	3.13	1.25

APPENDIX 14 (c) FUSKAR AREWA { NORTH SECTOR } SOCIO-ECONOMIC DATA

UNIT	WORK				PERCEPTION					POSSESSION			
	Male	Female &Space			City	Ward	Dwelling		Social Cohesion	I	P/B	G	R
		B	C	D/E			Spat'l	Phys					
ADK-1	•	•	√	•	•	√	•	√	•	•	√	•	•
ADK-2	•	√	•	•	•	√	•	√	•	•	√	•	•
ADK-3	•	•	•	•	•	√	•	•	√	√	•	•	•
ADK-4	•	•	√	√	•	√	•	√	√	√	•	•	•
ADK-5	•	•	√	•	√	•	•	√	•	•	•	•	√
CDY-1	•	•	√	•	•	√	•	•	•	•	√	•	•
CDY-2	•	•	√	•	•	√	•	√	√	√	•	•	•
CDY-3	•	•	•	√	•	√	•	√	√	•	√	•	•
CDY-4	•	•	•	√	√	•	•	√	√	√	•	•	•
CDY-5	•	•	•	√	•	√	•	√	√	√	•	•	•
DAL-1	•	•	•	•	•	√	•	√	√	√	•	•	•
DAL-2	•	•	•	√	•	√	•	√	√	•	√	•	•
DAL-3	√	•	•	√	•	•	•	√	•	√	•	•	•
DAL-4	•	•	•	•	•	√	•	√	•	•	√	•	•
DAL-5	•	•	•	•	•	√	•	√	√	√	•	•	•
DKR -1	•	•	•	•	√	•	•	•	•	•	√	•	•
DKR -2	√	•	√	•	√	•	•	√	•	√	•	•	•
DKR -3	√	•	•	√	•	√	•	√	•	√	•	•	•
DKR -4	•	•	•	•	•	√	•	√	•	√	•	•	•
DKR -5	•	•	√	•	•	√	•	√	•	√	√	•	•
DNL -1	•	•	•	•	•	•	•	•	•	√	•	•	•
DNL -2	•	•	√	√	•	√	•	√	•	•	•	√	•
DNL -3	•	•	•	•	•	√	•	√	•	√	•	•	•
DNL -4	√	•	√	•	•	√	√	√	•	√	•	•	•
DNL -5	•	•	•	•	•	√	•	√	•	√	•	•	•
MDB -1	√	•	√	•	•	√	•	√	•	√	•	•	•
MDB -2	√	•	•	√	•	√	•	•	•	√	•	•	•
MDB -3	•	√	•	•	•	√	•	•	√	√	•	•	•
MDB -4	√	•	√	√	•	√	•	√	•	√	•	•	•
MDB -5	√	•	•	•	•	√	•	√	•	√	•	•	•
TMK -1	•	•	√	•	•	√	•	•	•	√	•	•	•
TMK -2	•	•	•	√	•	√	•	√	√	√	•	•	•
TMK -3	•	•	√	•	√	•	√	√	•	√	•	•	•
TMK -4	•	•	√	•	•	√	•	√	•	√	•	•	•
TMK -5	√	•	•	√	•	√	•	•	•	√	•	•	•
Count	9	2	14	12	5	28	2	27	11	26	8	1	1
% of Sector	25.70	5.70	40	34.3	14.3	80	5.70	77.10	31.40	74.3	22.8	2.9	2.85
% of Sample	5.63	1.25	8.75	7.50	3.13	17.50	1.25	16.88	6.88	16.3	5.00	0.6	0.63

APPENDIX 14(d) FUSKAR YAMMA { WEST SECTOR } SOCIO-ECONOMIC DATA

UNIT	WORK				PERCEPTION					POSSESSION			
	Male	Female &Space			City	Ward	Dwelling		Social Cohesion	I	P/B	G	R
		B	C	D/E			Spat'l	Phys					
BRW -1	•	•	√	√	•	√	•	√	√	√	•	•	•
BRW -2	√	•	√	•	•	√	•	√	•	√	•	•	•
BRW -3	•	•	•	•	•	√	•	√	√	√	•	•	•
BRW -4	•	•	•	•	•	√	√	•	√	√	•	•	•
BRW -5	•	•	√	•	•	√	•	√	√	√	•	•	•
DIS -1	√	•	√	•	•	√	•	•	√	√	•	•	•
DIS -2	•	•	•	•	•	√	•	√	√	√	•	•	•
DIS -3	√	•	√	√	•	√	•	√	•	√	•	•	•
DIS -4	•	•	•	•	√	•	•	√	√	√	•	•	•
DIS -5	•	√	√	•	•	√	√	•	•	√	•	•	•
JNG -1	•	•	•	•	•	√	•	√	•	√	•	•	•
JNG -2	•	√	√	•	•	√	•	√	•	•	•	√	•
JNG -3	•	√	√	•	√	•	•	√	•	√	•	•	•
JNG -4	•	•	√	•	•	√	√	√	•	√	•	•	•
JNG -5	•	•	•	•	√	•	•	√	•	√	•	•	•
LMK-1	√	•	√	•	√	•	•	√	•	√	•	•	•
LMK-2	√	•	•	√	•	√	•	•	•	•	√	•	•
LMK-3	•	•	•	•	•	√	•	√	•	√	•	•	•
LMK-4	•	•	•	√	•	√	•	√	•	•	√	•	•
LMK-5	•	•	•	•	•	√	√	•	•	•	√	•	•
SMN-1	•	•	√	√	•	√	•	√	•	•	√	•	•
SMN-2	•	•	√	•	•	√	•	√	•	√	•	•	•
SMN-3	•	•	√	•	•	√	√	•	•	•	•	√	•
SMN-4	•	•	•	√	•	√	•	√	•	•	√	•	•
SMN-5	•	•	√	•	•	√	•	√	•	•	√	•	•
WRR-1	√	•	√	•	√	•	√	√	√	√	•	•	•
WRR-2	•	√	•	•	•	√	√	√	√	√	•	•	•
WRR-3	•	•	•	•	•	√	•	√	√	√	•	•	•
WRR-4	•	•	√	•	•	√	•	•	•	√	•	•	•
WRR-5	•	•	√	•	•	√	•	•	•	√	•	•	•
Count	6	4	17	6	5	25	7	22	10	22	6	2	-
% Of Sector	20	13.3	56.7	20	16.7	83.33	23.33	73.33	33.33	73.3	20	6.7	-
% Of Sample	3.75	2.50	10.6	3.75	3.13	15.63	4.38	13.75	6.25	13.8	3.75	1.3	-

APPENDIX 15a: RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES														
						Zaure RRA			Kofargida RRA			Courtyard RRA			Rumfa RRA			Ɗaki RRA		
			Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1	ADK-1	8	0.73	2.47	1.53	1.02	1.60	1.31	–	–	–	0.73	1.02	0.87	–	–	–	1.89	1.89	1.89
2	ADK-2	16	0.49	1.78	1.25	0.72	1.10	0.91	–	–	–	0.49	0.80	0.65	0.80	1.25	1.02	1.02	1.78	1.38
3	ADK-3	10	0.64	2.27	1.40	1.00	1.00	1.00	1.55	1.55	1.55	0.82	0.82	0.82	1.18	1.18	1.18	1.55	1.91	1.73
4	ADK-4	24	0.66	1.78	1.32	1.28	1.28	1.28	0.66	0.89	0.77	0.70	0.97	0.89	1.08	1.35	1.27	1.35	1.78	1.63
5	ADK-5	18	0.65	2.14	1.28	1.21	1.67	1.44	0.84	0.84	0.84	0.68	0.76	0.72	1.14	1.21	1.18	1.37	1.75	1.59
6	ALF-1	12	0.64	2.17	1.39	0.68	1.53	1.06	–	–	–	0.89	0.89	0.89	1.40	1.53	1.47	1.53	2.04	1.79
7	ALF-2	16	0.61	1.90	1.28	0.61	0.91	0.76	–	–	–	0.68	0.68	0.68	1.06	1.37	1.21	1.44	1.90	1.68
8	ALF-3	27	0.71	1.88	1.32	0.91	1.88	1.49	–	–	–	1.04	1.04	1.04	0.71	1.11	0.91	1.11	1.54	1.30
9	ALF-4	24	0.83	2.26	1.54	0.99	1.18	1.08	1.41	1.41	1.41	0.83	2.26	1.74	1.18	1.45	1.31	1.60	1.84	1.76
10	ALF-5	11	0.68	2.11	1.44	0.68	1.43	1.01	–	–	–	0.90	2.11	1.51	1.21	1.21	1.21	1.58	1.88	1.68
11	ALF-6	17	0.92	2.43	1.67	0.92	1.91	1.30	–	–	–	1.20	1.20	1.20	1.50	1.61	1.55	1.71	2.12	2.00
12	ALF-7	10	0.64	2.27	1.47	1.00	1.55	1.27	–	–	–	0.64	0.64	0.64	1.00	1.18	1.09	1.55	2.27	1.91
13	ALF-8	24	0.56	2.18	1.28	0.87	1.22	1.05	–	–	–	0.56	1.37	0.97	0.91	1.76	1.16	0.99	2.18	1.58
14	BRW-1	18	0.59	2.08	1.30	0.90	1.33	1.12	–	–	–	0.81	0.84	0.82	1.24	1.24	1.24	1.09	1.74	1.49
15	BRW-2	15	0.94	2.51	1.60	1.06	1.57	1.30	1.95	2.51	2.23	0.98	1.53	1.33	1.36	1.36	1.36	1.91	1.91	1.91
16	BRW-3	17	0.58	1.74	1.19	0.62	1.23	0.92	–	–	–	0.58	1.09	0.90	0.89	0.89	0.89	1.13	1.74	1.37
17	BRW-4	17	0.51	1.85	1.14	0.89	1.33	1.11	–	–	–	0.55	0.55	0.55	0.89	0.99	0.96	1.40	1.50	1.46
18	BRW-5	9	0.56	2.26	1.40	0.90	1.47	1.18	–	–	–	0.56	1.13	0.85	1.13	1.13	1.13	1.92	1.92	1.92
19	BZW-1	14	0.87	2.79	1.61	1.01	1.68	1.33	–	–	–	0.91	0.91	0.91	1.01	1.87	1.44	1.49	2.74	1.97
20	BZW-2	18	0.65	2.20	1.33	1.27	1.71	1.49	0.90	0.90	0.90	0.65	0.65	0.65	1.02	1.46	1.21	1.21	1.95	1.57
21	BZW-3	9	0.90	2.71	1.65	1.02	1.92	1.43	–	–	–	0.90	0.90	0.90	1.24	1.24	1.24	2.03	2.03	2.03
22	BZW-4	6	0.29	2.01	1.24	0.86	0.86	0.86	–	–	–	0.29	0.29	0.29	–	–	–	1.43	1.43	1.43
23	BZW-5	13	0.72	2.15	1.44	0.88	1.54	1.19	2.15	2.15	2.15	0.72	1.21	0.96	0.99	0.99	0.99	1.60	1.82	1.65

APPENDIX 15b: RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA														
						Zaure			Kofargida			Courtyard			Rumfa			Ɗaki		
			Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
24	CDY-1	12	0.96	2.74	1.70	1.21	2.11	1.64	–	–	–	0.96	0.96	0.96	0.96	1.85	1.43	2.11	2.49	2.30
25	CDY-2	11	0.60	2.19	1.41	0.98	1.51	1.24	–	–	–	0.60	0.60	0.60	0.98	1.51	1.24	1.66	2.19	1.83
26	CDY-3	14	0.67	2.60	1.41	0.87	2.02	1.39	–	–	–	0.67	0.67	0.67	0.96	1.15	1.06	1.54	1.73	1.59
27	CDY-4	13	0.83	2.42	1.51	0.88	1.82	1.27	–	–	–	0.83	0.83	0.83	1.32	1.32	1.32	1.93	1.93	1.93
28	CDY-5	15	0.30	1.61	0.96	0.77	0.77	0.77	–	–	–	0.30	0.30	0.30	0.60	0.77	0.68	0.85	1.61	1.22
29	DAL-1	9	0.45	1.92	1.15	0.56	1.13	0.85	–	–	–	0.45	0.45	0.45	–	–	–	1.24	1.24	1.24
30	DAL-2	40	1.32	2.97	2.06	1.32	2.06	1.60	1.58	1.58	1.58	1.37	2.32	1.80	1.69	2.64	2.16	1.93	2.97	2.45
31	DAL-3	12	0.51	2.30	1.24	0.77	1.66	1.19	–	–	–	0.51	0.89	0.70	–	–	–	1.15	1.53	1.24
32	DAL-4	9	0.90	2.71	1.65	1.02	1.92	1.43	–	–	–	0.90	0.90	0.90	1.24	1.24	1.24	1.69	2.03	1.92
33	DAL-5	9	0.56	2.26	1.35	0.90	1.47	1.18	–	–	–	0.56	0.56	0.56	0.90	0.90	0.90	1.69	1.69	1.69
34	DBZ-1	18	0.71	1.89	1.36	0.96	1.40	1.18	–	–	–	0.71	0.71	0.71	1.15	1.33	1.22	1.64	1.83	1.73
35	DBZ-2	48	1.00	2.54	1.71	0.97	1.31	1.12	1.02	1.02	1.02	1.26	1.89	1.53	1.53	2.19	1.80	1.51	2.50	1.87
36	DBZ-3	10	0.73	2.00	1.45	0.73	1.27	1.00	–	–	–	0.73	0.73	0.73	1.27	1.27	1.27	2.00	2.00	2.00
37	DBZ-4	13	0.38	1.83	1.06	0.77	1.25	1.01	–	–	–	0.38	0.96	0.67	0.77	0.87	0.82	0.87	1.44	1.25
38	DBZ-5	17	0.75	2.12	1.47	0.92	1.54	1.23	1.16	1.16	1.16	0.75	0.75	0.75	0.92	1.61	1.24	1.44	2.12	1.89
39	DNL-1	11	0.75	2.34	1.51	1.13	1.66	1.46	–	–	–	1.13	1.66	1.39	0.98	0.98	0.98	1.51	1.66	1.58
40	DNL-2	12	0.70	2.23	1.47	0.70	1.60	1.13	–	–	–	0.83	0.83	0.83	1.34	1.60	1.47	1.98	2.23	2.11
41	DNL-3	11	1.13	3.01	1.82	1.81	2.34	2.07	1.21	1.43	1.32	1.13	1.21	1.17	1.73	1.73	1.73	1.88	2.41	2.15
42	DNL-4	20	0.94	2.34	1.57	0.94	1.35	1.09	–	–	–	1.09	1.56	1.33	1.51	1.87	1.69	1.40	2.34	1.86
43	DNL-5	19	0.71	2.12	1.34	0.71	1.64	1.10	–	–	–	0.74	0.74	0.74	0.99	1.64	1.25	1.47	2.12	1.60
44	DRM-1	26	0.66	2.23	1.34	1.00	1.38	1.19	0.66	0.66	0.66	0.77	1.34	0.97	1.04	1.82	1.34	1.38	2.23	1.64
45	DRM-2	10	0.55	2.00	1.27	1.27	1.27	1.27	0.73	0.73	0.73	1.46	1.46	1.46	0.91	0.91	0.91	1.27	1.64	1.52
46	DRM-3	11	0.68	2.49	1.41	1.28	1.81	1.55	0.90	0.90	0.90	0.68	0.90	0.79	–	–	–	1.36	1.58	1.51
47	DRM-4	19	0.76	2.24	1.45	0.85	1.44	1.12	0.76	0.76	0.76	0.99	0.99	0.99	1.33	1.42	1.37	1.25	1.92	1.63
48	DRM-5	10	0.64	2.45	1.40	0.82	1.73	1.24	–	–	–	0.64	0.64	0.64	1.18	1.18	1.18	1.36	1.91	1.64

APPENDIX 15c: RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA														
						Zaure			Kofargida			Courtyard			Rumfa			Ɗaki		
49	DIS-1	98	0.84	2.04	1.41	0.99	1.56	1.22	0.89	1.37	1.15	0.84	1.79	1.26	1.07	1.80	1.45	1.08	2.04	1.56
50	DIS-2	20	0.68	2.55	1.39	0.78	1.30	1.02	–	–	–	0.68	0.68	0.68	1.09	2.08	1.65	1.14	2.55	1.63
51	DIS-3	41	0.72	2.00	1.40	0.82	1.21	1.07	0.72	0.80	0.76	1.00	1.83	1.29	1.32	1.67	1.54	1.28	2.00	1.60
52	DIS-4	17	0.75	2.49	1.46	0.92	1.98	1.48	1.16	1.16	1.16	0.85	0.85	0.85	0.85	1.30	1.12	1.26	1.81	1.59
53	DIS-5	10	0.55	2.36	1.27	0.73	1.64	1.12	–	–	–	0.55	0.55	0.55	–	–	–	1.27	1.27	1.27
54	DKR-1	23	0.64	2.40	1.33	1.01	1.97	1.46	–	–	–	0.64	0.64	0.64	0.91	1.22	1.07	1.08	2.40	1.47
55	DKR-2	15	0.64	2.04	1.30	0.94	1.40	1.17	–	–	–	0.64	0.68	0.66	1.06	1.49	1.28	1.23	2.04	1.67
56	DKR-3	19	0.48	1.75	1.09	0.85	1.27	1.06	–	–	–	0.48	0.51	0.50	0.85	0.93	0.91	1.33	1.42	1.38
57	DKR-4	14	0.77	2.21	1.49	0.77	1.06	0.91	–	–	–	0.87	1.15	1.01	1.54	1.63	1.59	1.59	2.21	1.93
58	DKR-5	14	0.72	2.16	1.39	0.72	1.59	1.14	–	–	–	0.72	0.72	0.72	1.01	1.59	1.30	1.59	2.16	1.73
59	DAR-1	26	0.68	1.95	1.29	1.02	1.37	1.26	–	–	–	0.83	0.83	0.83	1.14	1.22	1.18	1.02	1.95	1.45
60	DAR-2	11	0.53	1.81	1.25	0.75	1.13	0.94	–	–	–	0.53	0.90	0.72	–	–	–	1.21	1.81	1.45
61	DAR-3	20	0.81	2.78	1.58	1.22	1.90	1.55	–	–	–	0.96	1.01	0.99	1.22	1.90	1.53	1.27	2.78	1.98
62	DAR-4	13	0.77	2.37	1.40	0.88	1.27	1.07	0.77	0.77	0.77	1.21	1.21	1.21	0.83	0.83	0.83	1.10	1.82	1.50
63	DAR-5	23	0.66	2.34	1.31	0.91	1.90	1.38	–	–	–	0.66	0.68	0.67	0.93	1.41	1.11	1.37	2.34	1.56
64	GBR-1	24	0.46	1.66	1.07	0.83	1.57	1.16	–	–	–	0.68	0.68	0.68	1.03	1.18	1.08	1.47	2.01	1.63
65	GBR-2	11	0.98	2.34	1.60	0.98	1.66	1.24	–	–	–	1.06	1.06	1.06	–	–	–	1.73	2.34	1.88
66	GBR-3	11	0.83	2.71	1.55	1.13	2.04	1.56	–	–	–	0.83	0.83	0.83	–	–	–	1.51	2.04	1.77
67	GBR-4	15	0.60	2.04	1.31	1.11	1.49	1.30	–	–	–	0.60	0.60	0.60	0.89	0.89	0.89	1.15	2.04	1.44
68	GBR-5	12	0.38	1.92	1.12	1.28	1.28	1.28	–	–	–	0.38	0.77	0.57	0.89	0.89	0.89	1.02	1.53	1.28
69	JNG -1	32	0.58	1.81	1.27	0.82	1.42	1.04	–	–	–	0.68	1.38	1.05	1.38	1.44	1.42	1.33	1.80	1.69
70	JNG -2	19	0.93	2.41	1.65	1.02	1.78	1.32	1.36	1.36	1.36	0.93	1.19	1.06	1.50	1.56	1.53	1.78	2.41	2.00
71	JNG -3	26	0.68	1.97	1.37	0.78	1.40	1.02	–	–	–	0.68	1.23	1.02	1.02	1.57	1.35	1.09	1.97	1.55
72	JNG -4	33	0.44	1.59	1.06	1.26	1.26	1.26	0.48	0.79	0.64	0.70	1.32	1.02	0.74	1.30	1.00	1.03	1.71	1.38
73	JNG -5	16	0.76	2.28	1.47	0.76	1.59	1.16	–	–	–	0.84	0.84	0.84	1.14	1.29	1.21	1.67	1.82	1.72

APPENDIX 15d : RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA														
						Zaure			Kofargida			Courtyard			Rumfa			'Daki		
74	KOK-1	27	0.75	1.76	1.22	1.03	1.12	1.07	–	–	–	0.83	0.83	0.83	1.09	1.17	1.13	1.17	1.57	1.41
75	KOK-2	27	1.03	2.68	1.68	1.03	1.52	1.24	–	–	–	1.09	1.09	1.09	1.27	2.23	1.80	1.67	2.68	2.00
76	KOK-3	13	0.55	2.31	1.29	0.83	1.21	1.02	–	–	–	0.55	0.55	0.55	1.32	1.32	1.32	1.16	2.31	1.60
77	KOK-4	11	0.90	2.79	1.63	0.98	2.11	1.56	1.21	1.21	1.21	0.90	0.90	0.90	1.28	1.28	1.28	1.96	1.96	1.96
78	KOK-5	43	0.55	1.88	1.12	1.00	1.26	1.13	1.00	1.88	1.45	0.55	1.19	0.78	0.86	1.26	1.07	0.87	1.55	1.12
79	KMG-1	44	0.64	1.83	1.24	1.29	1.29	1.29	1.00	1.00	1.00	0.97	1.47	1.20	1.03	1.79	1.43	1.05	2.07	1.55
80	KMG-2	66	0.72	2.21	1.41	0.93	1.44	1.11	0.74	0.95	0.84	0.72	1.66	1.15	1.11	1.93	1.49	1.00	2.21	1.57
81	KMG-3	12	0.51	2.30	1.24	1.15	1.66	1.40	0.77	0.77	0.77	0.51	0.51	0.51	0.89	0.89	0.89	1.15	1.53	1.34
82	KMG-4	8	1.02	2.76	1.74	1.31	1.89	1.60	1.02	1.02	1.02	1.02	1.02	1.02	1.60	1.60	1.60	2.47	2.47	2.47
83	KMG-5	14	0.43	1.68	1.15	0.72	1.11	0.91	–	–	–	0.43	0.43	0.43	0.82	0.91	0.88	1.39	1.68	1.49
84	LMK-1	18	0.50	1.67	1.10	1.24	1.24	1.24	0.50	0.81	0.65	0.62	1.12	0.81	–	–	–	1.12	1.61	1.20
85	LMK-2	18	0.62	2.23	1.30	0.68	1.12	0.90	–	–	–	0.62	0.62	0.62	0.99	1.30	1.12	1.12	2.23	1.58
86	LMK-3	22	0.64	2.16	1.36	0.78	1.31	1.02	1.71	1.71	1.71	0.64	1.40	1.02	1.04	1.71	1.38	1.09	2.16	1.67
87	LMK-4	10	0.46	2.09	1.22	0.82	1.36	1.09	–	–	–	0.46	0.46	0.46	0.82	0.82	0.82	1.18	1.55	1.36
88	LMK-5	15	0.64	2.08	1.31	0.68	1.53	1.09	–	–	–	0.94	1.06	1.00	1.11	1.49	1.30	1.19	1.66	1.49
89	MDB-1	30	0.82	2.18	1.55	0.95	1.80	1.29	0.82	1.14	0.95	1.17	1.42	1.29	1.31	1.77	1.55	1.55	2.18	1.87
90	MDB-2	15	0.68	2.38	1.37	0.68	1.83	1.21	–	–	–	0.72	1.06	0.89	1.11	1.11	1.11	1.28	1.68	1.56
91	MDB-3	14	1.11	3.03	1.78	1.11	2.45	1.64	1.30	1.30	1.30	1.20	1.20	1.20	1.59	1.59	1.59	1.68	2.16	2.00
92	MDB-4	41	0.64	1.78	1.25	0.88	0.92	0.90	0.64	0.64	0.64	0.67	1.15	0.85	0.99	1.45	1.17	1.11	1.78	1.47
93	MDB-5	7	0.39	1.96	1.29	0.98	0.98	0.98	–	–	–	0.39	0.39	0.39	0.98	0.98	0.98	1.37	1.96	1.67
94	MGN-1	13	0.66	2.20	1.37	0.72	1.60	1.14	–	–	–	1.16	1.16	1.16	1.05	1.05	1.05	1.65	1.82	1.71
95	MGN-2	13	0.55	2.04	1.15	1.38	1.38	1.38	–	–	–	0.61	0.61	0.61	0.55	1.43	0.99	0.94	2.04	1.38
96	MGN-3	9	0.56	2.03	1.30	1.13	1.13	1.13	–	–	–	0.68	0.68	0.68	1.24	1.24	1.24	1.47	2.03	1.75
97	MGN-4	17	0.65	2.08	1.35	0.82	1.26	1.04	–	–	–	0.65	0.65	0.65	1.03	1.57	1.24	1.54	2.08	1.70
98	MGN-5	15	0.77	2.68	1.55	0.98	1.66	1.32	–	–	–	0.77	1.36	1.06	0.98	1.83	1.40	1.53	2.68	2.09

APPENDIX 15e: RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA																	
						Zaure			Kofargida			Courtyard			Rumfa			'Daki		
99	SMN-1	21	0.55	2.21	1.23	0.94	1.34	1.16	0.72	0.72	0.72	0.55	0.55	0.55	0.96	1.18	1.06	1.01	2.21	1.50
100	SMN-2	13	0.33	1.71	1.00	1.10	1.10	1.10	0.61	0.61	0.61	0.33	0.33	0.33	0.72	0.72	0.72	0.94	1.32	1.20
101	SMN-3	11	0.38	1.36	0.97	0.98	1.36	1.17	–	–	–	0.38	0.38	0.38	–	–	–	0.75	1.06	0.98
102	SMN-4	18	0.81	2.17	1.44	0.87	1.67	1.26	0.81	0.81	0.81	0.81	0.81	0.81	1.24	1.55	1.32	1.30	2.05	1.77
103	SMN-5	18	0.53	1.77	1.12	0.53	0.90	0.71	–	–	–	0.53	0.53	0.53	0.96	1.27	1.04	1.36	1.77	1.50
104	SRF -1	11	0.68	2.26	1.41	1.06	1.58	1.32	–	–	–	0.75	0.75	0.75	1.28	1.28	1.28	1.43	1.96	1.76
105	SRF -2	15	0.77	1.87	1.40	0.77	1.23	1.01	0.81	0.81	0.81	0.98	1.32	1.15	–	–	–	1.36	1.87	1.63
106	SRF -3	16	1.06	2.20	1.68	1.06	1.29	1.16	–	–	–	1.29	1.52	1.40	1.67	1.67	1.67	1.82	2.20	2.06
107	SRF -4	12	0.77	2.17	1.50	0.89	1.53	1.19	–	–	–	0.77	0.77	0.77	1.15	1.15	1.15	1.79	2.17	1.92
108	SRF -5	7	0.79	2.55	1.63	1.57	1.57	1.57	–	–	–	0.79	0.79	0.79	1.37	1.37	1.37	2.36	2.36	2.36
109	SHS -1	22	0.78	2.51	1.52	1.31	2.07	1.68	–	–	–	0.78	1.00	0.89	1.18	1.67	1.42	1.62	2.11	1.95
110	SHS -2	9	0.68	2.37	1.30	1.02	1.58	1.30	–	–	–	0.68	0.68	0.68	0.68	0.68	0.68	1.47	1.47	1.47
111	SHS -3	7	0.79	2.55	1.63	0.98	1.57	1.28	–	–	–	0.79	0.79	0.79	1.37	1.37	1.37	2.36	2.36	2.36
112	SHS -4	20	0.73	2.18	1.44	0.73	1.33	1.03	–	–	–	1.09	1.40	1.25	1.04	1.72	1.38	1.07	2.18	1.74
113	SHS -5	23	0.93	2.92	1.71	0.93	2.48	1.62	1.74	1.74	1.74	1.08	1.08	1.08	1.26	1.88	1.50	1.70	2.32	1.93
114	SDK-1	10	1.09	2.55	1.75	1.09	1.82	1.39	1.09	1.09	1.09	1.27	1.27	1.27	1.82	1.82	1.82	2.00	2.55	2.27
115	SDK-2	15	0.60	2.51	1.34	0.81	1.95	1.34	–	–	–	0.60	1.06	0.83	1.06	1.61	1.34	0.98	1.53	1.35
116	SDK-3	34	1.16	2.78	1.84	1.16	1.79	1.46	1.16	2.78	1.91	1.41	2.10	1.65	2.13	2.13	2.13	1.54	2.49	2.04
117	SDK-4	19	0.76	2.04	1.34	0.79	1.56	1.09	0.76	0.76	0.76	1.02	1.08	1.05	–	–	–	1.25	1.56	1.47
118	SDK-5	24	0.66	1.55	1.16	1.24	1.24	1.24	0.79	1.55	1.14	0.85	0.85	0.85	–	–	–	1.12	1.55	1.28
119	SDK-6	19	0.79	2.72	1.43	1.13	2.24	1.60	0.88	1.81	1.34	0.82	1.30	1.14	1.19	2.24	1.71	1.30	2.24	1.66
120	SDK-7	28	0.55	1.91	1.24	0.76	1.24	0.90	0.55	0.55	0.55	0.79	1.15	1.01	1.15	1.52	1.35	1.15	1.91	1.48
121	SDK-8	7	0.79	2.55	1.63	1.57	1.57	1.57	–	–	–	0.79	0.79	0.79	1.37	1.37	1.37	2.36	2.36	2.36

APPENDIX 15f: RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA														
						Zaure			Kofargida			Courtyard			Rumfa			'Daki		
122	TMK-1	8	0.44	1.89	1.23	1.02	1.02	1.02	–	–	–	0.44	0.44	0.44	0.73	0.73	0.73	1.60	1.60	1.60
123	TMK-2	12	1.09	2.62	1.74	1.09	1.98	1.44	–	–	–	1.09	1.09	1.09	1.85	1.85	1.85	2.49	2.62	2.55
124	TMK-3	8	0.44	1.89	1.23	1.02	1.02	1.02	–	–	–	0.44	0.44	0.44	0.73	0.73	0.73	1.60	1.60	1.60
125	TMK-4	12	0.77	2.04	1.50	1.02	1.40	1.21	0.77	0.77	0.77	0.89	0.89	0.89	1.28	1.28	1.28	1.92	2.04	1.95
126	TMK-5	14	0.67	2.50	1.40	1.06	1.44	1.25	–	–	–	0.67	0.67	0.67	1.15	1.15	1.15	1.73	2.50	1.92
127	TNF-1	9	0.34	1.80	1.00	0.68	1.02	0.85	–	–	–	0.34	0.34	0.34	–	–	–	1.13	1.13	1.13
128	TNF-2	31	0.51	2.12	1.17	1.08	1.40	1.24	1.75	1.75	1.75	0.51	1.02	0.74	0.83	1.32	1.05	0.88	1.70	1.27
129	TNF-3	18	1.27	2.70	1.87	1.27	1.89	1.42	1.46	1.46	1.46	1.46	1.77	1.61	1.83	2.20	2.01	2.32	2.70	2.45
130	TNF-4	13	0.99	2.91	1.73	1.16	1.82	1.47	2.31	2.31	2.31	0.99	0.99	0.99	1.05	1.93	1.49	1.65	2.53	1.99
131	TNF-5	19	0.68	2.07	1.31	0.68	0.88	0.78	0.76	0.76	0.76	1.02	1.02	1.02	1.22	1.59	1.40	1.16	2.07	1.64
132	UGN-1	14	0.63	2.36	1.34	0.91	1.78	1.33	–	–	–	0.63	0.63	0.63	1.11	1.11	1.11	1.20	1.68	1.36
133	UGN-2	43	0.74	1.80	1.30	0.76	1.43	1.03	–	–	–	0.74	0.86	0.80	1.05	1.48	1.29	1.06	1.80	1.48
134	UGN-3	13	0.72	2.47	1.42	0.99	1.87	1.41	–	–	–	0.72	0.77	0.74	1.27	1.27	1.27	1.32	1.87	1.69
135	UGN-4	10	0.55	2.36	1.27	1.09	1.64	1.36	–	–	–	0.55	0.55	0.55	–	–	–	1.27	1.27	1.27
136	UGN-5	12	0.38	1.92	1.07	0.77	1.28	1.02	–	–	–	0.38	0.64	0.51	–	–	–	1.02	1.28	1.09
137	UGN -6	17	0.62	2.12	1.32	0.85	1.61	1.21	–	–	–	0.62	1.13	0.95	1.06	1.54	1.30	1.13	1.54	1.33
138	UGN-7	9	0.34	2.03	1.10	1.31	1.31	1.31	–	–	–	0.44	0.44	0.44	–	–	–	1.31	1.31	1.31
139	UGN-8	13	0.28	1.54	0.91	0.55	0.94	0.74	–	–	–	0.28	0.28	0.28	–	–	–	0.88	0.88	0.88
140	WRR-1	12	0.57	2.23	1.28	1.09	1.60	1.34	0.70	0.70	0.70	0.57	0.57	0.57	1.21	1.21	1.21	1.21	1.60	1.47
141	WRR-2	16	0.57	2.24	1.33	0.87	1.25	1.06	–	–	–	0.57	0.95	0.76	0.95	1.25	1.10	1.10	2.24	1.62
142	WRR-3	13	0.88	2.86	1.57	0.94	2.26	1.51	1.38	1.38	1.38	0.88	1.49	1.18	1.38	1.38	1.38	1.49	1.98	1.73
143	WRR-4	12	0.96	1.98	1.55	1.09	1.34	1.21	–	–	–	0.96	0.96	0.96	1.21	1.21	1.21	1.85	1.98	1.90
144	WRR-5	41	0.55	1.71	1.17	0.81	1.39	1.10	0.55	0.55	0.55	0.80	0.84	0.83	1.07	1.16	1.12	1.17	1.71	1.41

APPENDIX 15g : RRA Generic Data

No	House	K-Sps	Unit House RRA			MAIN FUNCTIONAL SPACES RRA														
						Zaure			Kofargida			Courtyard			Rumfa			Ɗaki		
145	YKS -1	19	0.82	2.69	1.54	0.82	2.21	1.39	1.42	1.42	1.42	0.96	0.96	0.96	1.39	1.56	1.47	1.44	2.04	1.68
146	YKS -2	14	0.63	2.07	1.27	0.63	1.49	1.04	—	—	—	0.63	0.63	0.63	—	—	—	1.20	1.59	1.36
147	YKS-3	34	1.41	3.23	2.05	1.41	1.65	1.51	1.46	1.46	1.46	1.46	1.93	1.70	1.80	2.86	2.20	1.82	3.23	2.43
148	YKS-4	8	0.87	2.32	1.56	0.87	1.16	1.02	—	—	—	0.87	0.87	0.87	1.45	1.45	1.45	2.03	2.32	2.18
149	YKS-5	15	1.28	2.51	1.95	1.28	1.44	1.36	—	—	—	1.91	1.95	1.93	—	—	—	2.46	2.51	2.49
150	ZNG -1	21	0.60	1.56	1.15	0.70	1.10	0.90	—	—	—	0.60	1.10	0.83	1.01	1.01	1.01	1.25	1.56	1.38
151	ZNG -2	18	0.68	1.98	1.40	0.59	1.52	1.05	1.15	1.15	1.15	0.65	0.84	0.74	1.02	1.02	1.02	1.09	1.52	1.27
152	ZNG- 3	49	0.51	1.66	1.17	0.73	1.35	0.93	0.51	0.68	0.59	0.74	1.23	0.98	1.03	1.26	1.12	1.05	1.57	1.40
153	ZNG -4	18	0.59	2.01	1.23	1.36	1.36	1.36	0.92	0.92	0.92	0.68	1.12	0.87	1.30	1.49	1.40	1.30	1.98	1.72
154	ZNG- 5	11	1.21	3.09	1.90	1.28	2.41	1.77	—	—	—	1.28	1.28	1.28	1.96	1.96	1.96	2.34	2.34	2.34
155	ZNG- 6	10	0.73	2.36	1.49	1.09	1.64	1.36	—	—	—	0.73	0.73	0.73	0.91	1.27	1.09	2.00	2.00	2.00
156	ZBR-1	10	1.27	3.09	1.96	1.27	2.36	1.73	—	—	—	1.27	1.27	1.27	2.00	2.00	2.00	2.73	2.73	2.73
157	ZBR-2	16	0.80	2.47	1.55	1.10	1.94	1.51	—	—	—	0.87	0.87	0.87	1.18	1.48	1.33	1.71	2.01	1.83
158	ZBR-3	21	0.72	2.45	1.41	1.13	1.13	1.13	—	—	—	0.72	0.91	0.82	1.32	1.58	1.43	1.18	2.45	1.68
159	ZBR-4	22	0.80	2.09	1.41	0.84	1.20	0.98	0.80	0.80	0.80	0.93	1.24	1.09	1.16	1.64	1.36	1.38	2.09	1.70
160	ZBR-5	13	0.39	1.87	1.08	0.77	1.27	1.02	—	—	—	0.39	0.39	0.39	0.66	0.88	0.77	0.99	1.49	1.21

APPENDIX 16a: BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit BDF	Main Functional Spaces Set									
										ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
1	ADK-1	8	2.470	3.430	3	1.750	0.333	2.330	0.738	–	–	0.883	–	–	–	–	–	–	–
2	ADK-2	16	1.590	3.800	5	2.000	0.200	3.200	0.726	–	0.890	0.883	–	–	–	–	–	–	0.961
3	ADK-3	10	2.270	3.780	5	1.800	0.250	3.330	0.720	0.909	0.889	0.870	0.960	0.939	0.908	0.921	0.889	0.970	0.930
4	ADK-4	24	1.700	4.830	4	1.920	0.250	2.830	0.820	0.940	0.930	0.930	0.940	0.900	0.970	0.940	0.860	0.900	0.980
5	ADK-5	18	2.200	5.170	5	1.890	0.250	2.830	0.750	0.880	0.880	0.870	0.940	0.920	0.920	0.950	0.840	0.920	0.980
6	ALF -1	12	2.170	4.092	4	1.833	0.250	3.333	0.741	–	0.907	0.886	–	–	–	–	–	–	0.947
7	ALF -2	16	1.366	3.400	5	1.875	0.200	3.667	0.772	–	0.849	0.780	–	–	–	–	–	–	0.879
8	ALF -3	27	1.555	4.732	7	2.000	0.143	5.167	0.826	–	0.973	0.974	–	–	–	–	–	–	0.950
9	ALF -4	24	1.835	5.138	6	1.917	0.167	4.333	0.817	0.955	0.979	0.945	0.985	0.953	0.946	0.982	0.988	0.980	0.950
10	ALF -5	11	2.110	3.801	4	1.800	0.250	2.500	0.775	–	0.977	0.946	–	–	–	–	–	–	0.942
11	ALF -6	17	2.426	5.439	4	1.882	0.250	3.333	0.828	–	0.947	0.933	–	–	–	–	–	–	0.961
12	ALF -7	10	2.273	3.782	4	2.000	0.250	2.500	0.725	–	0.768	0.785	–	–	–	–	–	–	0.928
13	ALF -8	24	1.603	4.615	8	1.917	1.250	4.833	0.684	–	0.947	0.939	–	–	–	–	–	–	0.960
14	BRW-1	18	1.829	4.467	5	2.000	0.200	2.417	0.726	–	0.931	0.929	–	–	–	–	–	–	0.982
15	BRW-2	15	2.507	5.220	5	1.867	0.200	3.667	0.816	0.917	0.964	0.959	0.920	0.943	0.942	0.924	0.947	0.951	0.961
16	BRW-3	17	1.742	4.188	5	1.882	0.200	3.200	0.786	–	0.947	0.951	–	–	–	–	–	–	0.950
17	BRW-4	17	1.845	4.376	6	1.882	0.167	4.250	0.718	–	0.821	0.828	–	–	–	–	–	–	0.962
18	BRW-5	9	2.255	3.502	4	1.778	0.250	2.500	0.683	–	0.854	0.860	–	–	–	–	–	–	0.923
19	BZW-1	14	2.210	4.541	4	1.857	0.250	2.750	0.746	–	0.887	0.882	–	–	–	–	–	–	0.963
20	BZW-2	18	2.200	5.172	3	1.778	0.333	2.333	0.737	0.856	0.857	0.845	0.950	0.933	0.890	0.924	0.834	0.938	0.985
21	BZW-3	9	2.706	4.002	4	1.889	0.250	2.250	0.777	–	0.861	0.874	–	–	–	–	–	–	0.945
22	BZW-4	6	2.006	2.400	4	1.667	0.250	3.500	0.492	–	–	0.602	–	–	–	–	–	–	–
23	BZW-5	13	2.145	4.255	4	1.846	0.250	3.250	0.785	0.849	0.918	0.938	0.856	0.932	0.925	0.812	0.879	0.887	0.943

APPENDIX 16b :BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit	Main Functional Spaces Set									
									BDF	ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
24	CDY-1	12	2.744	4.911	3	1.833	0.333	1.833	0.793	–	0.845	0.857	–	–	–	–	–	–	0.948
25	CDY-2	11	2.185	3.901	4	1.818	0.250	2.333	0.720	–	0.782	0.782	–	–	–	–	–	–	0.956
26	CDY-3	14	2.595	5.157	5	1.857	0.200	3.250	0.677	–	0.858	0.859	–	–	–	–	–	–	0.967
27	CDY-4	13	2.419	4.673	5	1.846	0.200	3.500	0.786	–	0.862	0.859	–	–	–	–	–	–	0.953
28	CDY-5	15	1.317	3.217	8	1.867	0.125	5.833	0.571	–	0.659	0.675	–	–	–	–	–	–	0.916
29	DAL-1	9	1.916	3.559	5	1.778	0.200	4.333	0.658	–	–	0.814	–	–	–	–	–	–	–
30	DAL-2	40	1.915	6.568	5	1.950	0.200	4.250	0.871	0.995	0.981	0.958	0.972	0.944	0.978	0.979	0.957	0.961	0.962
31	DAL-3	12	2.297	4.273	6	1.833	0.167	4.833	0.622	–	–	0.928	–	–	–	–	–	–	–
32	DAL-4	9	2.706	4.002	3	1.778	0.333	2.333	0.777	–	0.882	0.892	–	–	–	–	–	–	0.958
33	DAL-5	9	2.255	3.502	4	1.778	0.250	2.833	0.678	–	0.757	0.788	–	–	–	–	–	–	0.918
34	DBZ-1	18	1.891	4.584	4	1.889	0.250	2.750	0.828	–	0.853	0.851	–	–	–	–	–	–	0.961
35	DBZ-2	48	1.312	5.134	6	1.958	0.167	4.750	0.837	0.961	0.991	0.947	0.918	0.904	0.977	0.936	0.928	0.919	0.940
36	DBZ-3	10	2.000	3.448	3	1.800	0.500	1.333	0.817	–	0.808	0.771	–	–	–	–	–	–	0.895
37	DBZ-4	13	1.826	3.772	7	1.923	0.143	5.000	0.614	–	0.914	0.926	–	–	–	–	–	–	0.963
38	DBZ-5	17	2.050	4.751	5	1.882	0.200	3.333	0.807	0.947	0.839	0.838	0.999	0.938	0.918	0.946	0.832	0.939	0.947
39	DNL-1	11	2.185	3.901	3	1.818	0.333	1.833	0.772	–	0.953	0.997	–	–	–	–	–	–	0.951
40	DNL-2	12	2.234	4.183	4	1.833	0.250	2.833	0.765	–	0.839	0.808	–	–	–	–	–	–	0.919
41	DNL-3	11	3.014	5.001	4	1.818	0.250	3.000	0.812	0.920	0.928	0.918	0.959	0.946	0.943	0.965	0.908	0.953	0.990
42	DNL-4	20	1.819	4.683	4	1.900	0.250	3.500	0.841	–	0.976	0.939	–	–	–	–	–	–	0.941
43	DNL-5	19	2.122	5.167	5	1.895	0.200	4.200	0.780	–	0.886	0.881	–	–	–	–	–	–	0.970
44	DRM1	26	1.786	5.201	5	1.923	0.200	2.538	0.738	0.933	0.946	0.942	0.902	0.849	0.979	0.904	0.832	0.849	0.978
45	DRM2	10	2.000	3.448	4	1.800	0.250	2.667	0.715	0.905	0.942	0.993	0.934	0.896	0.956	0.892	0.886	0.878	0.948
46	DRM3	11	2.487	4.301	4	1.800	0.250	3.250	0.700	0.889	–	0.902	–	0.935	–	–	0.898	–	–
47	DRM4	19	1.924	4.778	6	1.895	0.167	5.000	0.791	0.970	0.951	0.941	0.933	0.886	0.976	0.929	0.874	0.890	0.972
48	DRM5	10	2.454	4.004	5	1.800	0.200	4.000	0.684	–	0.837	0.838	–	–	–	–	–	–	0 973

APPENDIX 16c : BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit BDF	Main Functional Spaces Set									
										ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
49	DIS-1	98	1.191	5.916	9	2.041	0.111	7.000	0.851	0.998	0.991	0.985	0.988	0.978	0.993	0.989	0.979	0.980	0.987
50	DIS-2	20	1.455	3.946	7	1.900	0.143	4.833	0.685	–	0.835	0.844	–	–	–	–	–	–	0.946
51	DIS-3	41	0.944	3.780	6	1.951	0.167	4.500	0.809	0.944	0.990	0.967	0.900	0.887	0.994	0.903	0.894	0.882	0.963
52	DIS-4	17	2.494	5.564	4	1.882	0.250	2.250	0.738	0.940	0.919	0.918	0.980	0.979	0.949	0.978	0.922	0.967	0.973
53	DIS-5	10	2.364	3.893	6	1.800	0.167	5.500	0.634	–	–	0.862	–	–	–	–	–	–	–
54	DKR- 1	23	1.985	5.357	7	2.000	0.143	5.033	0.690	–	0.871	0.854	–	–	–	–	–	–	0.974
55	DKR-2	15	1.402	3.360	5	2.000	0.200	3.667	0.760	–	0.842	0.839	–	–	–	–	–	–	0.970
56	DKR-3	19	1.754	4.445	6	1.895	0.167	3.700	0.714	–	0.807	0.813	–	–	–	–	–	–	0.963
57	DKR-4	14	1.586	3.540	4	2.000	0.250	2.500	0.799	–	0.918	0.851	–	–	–	–	–	–	0.893
58	DKR-5	14	2.162	4.464	4	1.857	0.250	3.250	0.782	–	0.858	0.851	–	–	–	–	–	–	0.961
59	DAR-1	26	1.719	5.043	6	2.000	0.167	4.333	0.797	–	0.939	0.938	–	–	–	–	–	–	0.991
60	DAR-2	11	1.809	3.401	5	1.818	0.200	3.833	0.743	–	–	0.894	–	–	–	–	–	–	–
61	DAR-3	20	2.312	5.682	4	1.900	0.250	2.583	0.721	–	0.908	0.908	–	–	–	–	–	–	0.982
62	DAR-4	13	2.365	4.589	4	2.000	0.250	2.667	0.765	0.958	0.930	0.975	0.974	0.910	0.964	0.948	0.914	0.878	0.926
63	DAR -5	23	1.551	4.404	5	2.000	0.200	4.200	0.711	–	0.865	0.863	–	–	–	–	–	–	0.976
64	GBR -1	24	1.024	3.309	7	2.167	0.143	3.867	0.724	–	0.852	0.857	–	–	–	–	–	–	0.958
65	GBR-2	11	2.336	4.101	5	1.818	0.200	4.500	0.856	–	–	0.923	–	–	–	–	–	–	–
66	GBR -3	11	2.713	4.601	5	1.818	0.200	4.000	0.739	–	–	0.887	–	–	–	–	–	–	–
67	GBR -4	15	2.039	4.433	5	1.867	0.200	3.200	0.738	–	0.842	0.849	–	–	–	–	–	–	0.952
68	GBR -5	12	1.915	3.728	6	1.833	0.167	4.333	0.597	–	0.877	0.862	–	–	–	–	–	–	0.968
69	JNG -1	32	1.320	4.445	5	1.938	0.250	3.200	0.774	–	0.955	0.932	–	–	–	–	–	–	0.953
70	JNG -2	19	2.207	5.334	5	2.000	0.200	3.500	0.834	0.986	0.921	0.911	0.995	0.952	0.949	0.973	0.914	0.966	0.962
71	JNG -3	26	1.803	5.241	6	1.923	0.167	3.500	0.798	–	0.965	0.949	–	–	–	–	–	–	0.965
72	JNG -4	33	1.589	5.212	8	1.939	0.125	4.283	0.720	0.912	0.972	0.981	0.912	0.882	0.986	0.949	0.887	0.886	0.978
73	JNG -5	16	2.124	4.733	4	1.875	0.250	3.250	0.782	–	0.898	0.895	–	–	–	–	–	–	0.960

APPENDIX 16d: BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit BDF	Main Functional Spaces Set									
										ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
74	KOK 1	27	1.090	3.617	6	2.074	0.167	4.167	0.862	–	0.945	0.944	–	–	–	–	–	–	0.982
75	KOK-2	27	1.619	4.886	5	2.000	0.200	3.700	0.823	–	0.925	0.910	–	–	–	–	–	–	0.953
76	KOK-3	13	1.705	3.588	6	1.846	0.167	4.833	0.651	–	0.799	0.792	–	–	–	–	–	–	0.960
77	KOK-4	11	2.788	4.701	4	1.818	0.250	2.833	0.762	0.941	0.878	0.887	0.985	0.953	0.944	0.973	0.872	0.938	0.963
78	KOK 5	43	1.556	5.656	10	2.000	0.100	8.400	0.730	0.924	0.970	0.966	0.977	0.981	0.956	0.922	0.924	0.976	0.999
79	KMG-1	44	1.508	5.560	5	1.957	0.200	3.888	0.801	0.987	0.986	0.985	0.974	0.962	0.995	0.975	0.961	0.960	0.993
80	KMG-2	66	1.215	5.355	7	2.000	0.143	5.833	0.776	0.979	0.978	0.967	0.934	0.920	0.985	0.935	0.922	0.917	0.973
81	KMG-3	12	2.297	4.274	6	1.833	0.167	4.833	0.622	0.788	0.827	0.803	0.913	0.920	0.858	0.938	0.809	0.928	0.954
82	KMG-4	8	2.755	3.711	3	1.750	0.333	2.000	0.812	0.940	0.847	0.847	0.950	0.847	0.941	0.940	0.760	0.847	0.944
83	KMG-5	14	1.682	3.694	6	1.857	0.167	3.833	0.700	–	0.727	0.731	–	–	–	–	–	–	0.923
84	LMK -1	18	1.674	4.173	7	2.000	0.143	6.333	0.745	0.908	–	0.957	–	0.909	–	–	0.918	–	–
85	LMK- 2	18	1.612	4.056	5	1.889	0.200	2.500	0.710	–	0.840	0.818	–	–	–	–	–	–	0.933
86	LMK -3	22	2.155	5.613	7	1.909	0.143	4.500	0.745	0.920	0.952	0.928	0.946	0.938	0.919	0.947	0.940	0.989	0.951
87	LMK -4	10	2.091	3.559	5	1.800	0.200	3.833	0.626	–	0.775	0.789	–	–	–	–	–	–	0.948
88	LMK -5	15	2.082	4.505	4	1.867	0.250	3.250	0.752	–	0.968	0.962	–	–	–	–	–	–	0.980
89	MDB-1	30	2.178	6.520	5	1.933	0.200	4.000	0.826	0.977	0.972	0.959	0.953	0.907	0.991	0.953	0.907	0.912	0.972
90	MDB-2	15	2.379	5.005	4	1.867	0.200	3.667	0.718	–	0.933	0.937	–	–	–	–	–	–	0.972
91	MDB-3	14	3.027	5.850	4	1.857	0.250	2.833	0.800	0.977	0.948	0.948	0.987	0.962	0.973	0.983	0.933	0.961	0.987
92	MDB-4	41	1.227	4.612	6	2.050	0.167	3.083	0.809	0.974	0.940	0.919	0.928	0.855	0.971	0.926	0.846	0.870	0.952
93	MDB-5	7	1.963	2.668	4	1.714	0.250	3.000	0.611	–	0.655	0.655	–	–	–	–	–	–	0.916
94	MGN-1	13	2.200	4.339	4	1.846	0.250	2.250	0.744	–	0.941	0.953	–	–	–	–	–	–	0.940
95	MGN-2	13	1.320	3.003	5	2.000	0.200	3.750	0.697	–	0.872	0.856	–	–	–	–	–	–	0.973
96	MGN-3	9	1.916	3.126	4	1.778	0.250	2.833	0.722	–	0.835	0.829	–	–	–	–	–	–	0.954
97	MGN-4	17	1.572	3.876	5	2.000	0.200	3.167	0.761	–	0.832	0.819	–	–	–	–	–	–	0.948
98	MGN-5	15	2.124	4.576	5	1.867	0.200	3.333	0.719	–	0.904	0.897	–	–	–	–	–	–	0.944

APPENDIX 16e: BASIC SYNTACTIC MEASURES

No	House	K-sps	RRA Exterior	Mean Depth	Connectivity Max	Connectivity Mean	Control Min	Control Max	Base Difference Factor: Unit BDF	ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
99	SMN- 1	21	1.750	4.658	7	1.905	0.143	4.667	0.668	0.879	0.818	0.820	0.952	0.897	0.895	0.911	0.765	0.893	0.972
100	SMN- 2	13	1.705	3.588	7	1.846	0.143	5.667	0.586	0.728	0.712	0.716	0.918	0.905	0.811	0.885	0.684	0.889	0.944
101	SMN -3	11	1.130	2.500	6	2.000	0.167	4.667	0.728	–	–	0.776	–	–	–	–	–	–	–
102	SMN -4	18	2.169	5.113	6	1.889	0.167	4.000	0.818	0.941	0.883	0.881	0.946	0.881	0.941	0.928	0.813	0.883	0.971
103	SMN -5	18	1.364	3.586	6	2.000	0.167	3.750	0.745	–	0.804	0.750	–	–	–	–	–	–	0.890
104	SRF-1	11	2.261	4.001	4	1.818	0.250	2.833	0.745	–	0.866	0.866	–	–	–	–	–	–	0.973
105	SRF-2	15	1.784	4.004	5	1.867	0.200	4.333	0.853	0.975	–	0.946	–	0.889	–	–	0.901	–	–
106	SRF-3	16	1.593	3.799	5	1.875	0.200	4.500	0.899	–	0.969	0.926	–	–	–	–	–	–	0.934
107	SRF-4	12	2.170	4.092	4	1.833	0.250	2.500	0.805	–	0.830	0.834	–	–	–	–	–	–	0.928
108	SRF-5	7	2.552	3.169	3	1.714	0.333	2.000	0.755	–	0.771	0.785	–	–	–	–	–	–	0.931
109	SHS-1	22	2.511	6.374	5	1.909	0.200	3.500	0.752	–	0.883	0.881	–	–	–	–	–	–	0.980
110	SHS-2	9	2.367	3.718	5	2.000	0.200	3.833	0.711	–	0.818	0.883	–	–	–	–	–	–	0.883
111	SHS-3	7	2.552	3.169	3	1.714	0.333	2.000	0.755	–	0.771	0.759	–	–	–	–	–	–	0.900
112	SHS-4	20	1.793	4.631	4	2.000	0.250	3.333	0.784	–	0.976	0.941	–	–	–	–	–	–	0.946
113	SHS-5	23	2.916	7.399	5	1.913	0.200	4.250	0.758	0.951	0.933	0.933	0.995	0.994	0.952	0.954	0.930	0.987	0.986
114	SDK -1	10	2.545	4.116	3	1.800	0.333	2.000	0.862	0.988	0.934	0.914	0.947	0.881	0.962	0.941	0.867	0.897	0.952
115	SDK -2	15	2.507	5.220	6	1.867	0.167	3.833	0.643	–	0.944	0.944	–	–	–	–	–	–	1.000
116	SDK- 3	34	2.419	7.502	4	1.941	0.250	3.333	0.852	0.986	0.986	0.976	0.971	0.976	0.963	0.987	0.991	0.998	0.968
117	SDK -4	19	2.037	5.000	7	1.895	0.143	6.500	0.820	0.971	–	0.970	–	0.916	–	–	0.914	–	–
118	SDK -5	24	1.275	3.875	8	2.083	0.125	7.250	0.864	0.970	–	0.962	–	0.997	–	–	0.966	–	–
119	SDK -6	19	2.716	6.334	7	1.895	0.143	5.677	0.711	0.976	0.962	0.968	0.988	0.990	0.963	0.965	0.971	0.986	0.999
120	SDK -7	28	1.636	4.998	5	1.929	0.200	4.500	0.732	0.924	0.969	0.939	0.842	0.806	0.980	0.848	0.817	0.811	0.947
121	SDK -8	7	2.552	3.169	3	1.714	0.333	2.000	0.755	–	0.771	0.785	–	–	–	–	–	–	0.931

Header groups: BASIC SYNTACTIC MEASURES (RRA Exterior through ADE); Base Difference Factor (Unit BDF and Main Functional Spaces Set); Main Functional Spaces Set (ABC through ADE).

APPENDIX 16f : BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit BDF	Main Functional Spaces Set									
										ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
122	TMK-1	8	1.885	2.855	4	1.750	0.250	2.833	0.660	–	0.656	0.715	–	–	–	–	–	–	0.872
123	TMK-2	12	2.106	4.001	3	1.833	0.333	2.000	0.851	–	0.863	0.837	–	–	–	–	–	–	0.932
124	TMK-3	8	1.885	2.855	4	1.750	0.250	2.833	0.660	–	0.656	0.715	–	–	–	–	–	–	0.872
125	TMK-4	12	2.042	3.910	3	1.833	0.333	2.500	0.826	0.953	0.877	0.872	0.943	0.830	0.960	0.941	0.776	0.835	0.940
126	TMK-5	14	1.922	4.079	5	1.857	0.200	2.833	0.694	–	0.790	0.799	–	–	–	–	–	–	0.933
127	TNF-1	9	1.804	3.001	6	2.000	0.167	5.000	0.567	–	–	0.755	–	–	–	–	–	–	–
128	TNF-2	31	2.123	6.480	7	1.935	0.143	4.500	0.648	0.862	0.943	0.935	0.942	0.968	0.932	0.847	0.864	0.944	0.991
129	TNF-3	18	2.386	5.525	5	1.889	0.200	3.883	0.888	0.996	0.965	0.929	0.967	0.915	0.963	0.977	0.934	0.947	0.941
130	TNF-4	13	2.914	5.424	4	1.846	0.250	2.883	0.779	0.856	0.905	0.905	0.941	0.959	0.912	0.857	0.863	0.961	0.974
131	TNF-5	19	1.330	3.611	4	2.105	0.250	2.583	0.776	0.978	0.955	0.881	0.894	0.828	0.932	0.925	0.875	0.887	0.894
132	UGN-1	14	2.355	4.772	6	1.857	0.167	5.000	0.691	–	0.885	0.871	–	–	–	–	–	–	0.990
133	UGN -2	43	1.754	6.250	10	2.047	0.100	6.333	0.852	–	0.925	0.921	–	–	–	–	–	–	0.974
134	UGN- 3	13	2.474	4.756	4	1.846	0.250	2.750	0.722	–	0.874	0.873	–	–	–	–	–	–	0.982
135	UGN- 4	10	2.364	3.893	6	1.800	0.167	5.500	0.634	–	–	0.835	–	–	–	–	–	–	–
136	UGN- 5	12	1.915	3.728	6	1.883	0.167	4.750	0.591	–	–	0.883	–	–	–	–	–	–	–
137	UGN- 6	17	2.118	4.876	6	1.882	0.167	4.333	0.733	–	0.972	0.976	–	–	–	–	–	–	0.998
138	UGN- 7	9	2.029	3.251	6	1.788	0.167	5.500	0.522	–	–	0.767	–	–	–	–	–	–	–
139	UGN- 8	13	1.540	3.337	9	1.846	0.111	8.500	0.561	–	–	0.765	–	–	–	–	–	–	–
140	WRR-1	12	2.234	4.183	5	1.833	0.200	3.667	0.681	0.827	0.838	0.831	0.915	0.890	0.871	0.870	0.783	0.896	0.993
141	WRR-2	16	1.707	3.999	5	1.875	0.200	2.667	0.683	–	0.885	0.882	–	–	–	–	–	–	0.952
142	WRR-3	13	2.859	5.341	6	1.846	0.167	5.000	0.736	0.988	0.969	0.971	0.997	0.989	0.982	0.994	0.969	0.985	0.989
143	WRR-4	12	1.978	3.819	4	1.833	0.250	3.500	0.899	–	0.897	0.897	–	–	–	–	–	–	0.940
144	WRR-5	41	1.711	6.037	7	2.000	0.200	3.667	0.772	0.906	0.945	0.944	0.887	0.837	0.979	0.899	0.818	0.836	0.984

APPENDIX 16g: BASIC SYNTACTIC MEASURES

No	House	K-sps	BASIC SYNTACTIC MEASURES																
			RRA Exterior	Mean Depth	Connectivity		Control		Base Difference Factor										
					Max	Mean	Min	Max	Unit BDF	Main Functional Spaces Set									
										ABC	CDE	ACE	ABD	ABE	ADC	BCD	BCE	BDE	ADE
145	YKS-1	19	2.688	6.278	6	1.895	0.167	4.833	0.740	0.965	0.937	0.939	0.999	0.990	0.948	0.959	0.939	0.993	0.992
146	YKS-2	14	2.066	4.310	5	1.857	0.200	3.667	0.746	–	–	0.887	–	–	–	–	–	–	–
147	YKS-3	34	1.824	5.903	7	1.941	0.143	4.833	0.862	0.995	0.973	0.947	0.955	0.928	0.969	0.964	0.941	0.946	0.953
148	YKS-4	8	2.030	2.998	3	1.750	0.333	2.500	0.822	–	0.841	0.784	–	–	–	–	–	–	0.883
149	YKS-5	15	1.827	4.076	4	1.867	0.250	3.500	0.912	–	–	0.929	–	–	–	–	–	–	–
150	ZNG-1	21	1.055	3.205	5	2.000	0.200	3.700	0.834	–	0.945	0.934	–	–	–	–	–	–	0.958
151	ZNG-2	18	1.860	4.526	4	1.889	0.250	2.750	0.798	0.960	0.943	0.943	0.997	0.993	0.957	0.962	0.941	0.990	0.988
152	ZNG-3	49	1.658	6.261	9	1.959	0.111	4.783	0.762	0.944	0.974	0.957	0.921	0.858	0.997	0.919	0.862	0.864	0.966
153	ZNG-4	18	2.014	4.819	6	1.889	0.167	4.533	0.734	0.947	0.911	0.911	0.960	0.925	0.946	0.941	0.872	0.925	0.986
154	ZNG-5	11	3.090	5.101	3	1.818	0.333	2.333	0.826	–	0.929	0.928	–	–	–	–	–	–	0.984
155	ZNG-6	10	2.364	3.893	4	1.800	0.250	3.000	0.754	–	0.788	0.814	–	–	–	–	–	–	0.921
156	ZBR-1	10	3.091	4.783	4	1.800	0.250	3.000	0.845	–	0.889	0.878	–	–	–	–	–	–	0.954
157	ZBR-2	16	2.466	5.332	4	1.875	0.250	3.333	0.769	–	0.894	0.895	–	–	–	–	–	–	0.978
158	ZBR-3	21	1.582	4.306	7	1.905	0.143	5.000	0.728	–	0.898	0.892	–	–	–	–	–	–	0.968
159	ZBR-4	22	1.644	4.518	6	1.909	0.167	4.333	0.829	0.981	0.960	0.924	0.940	0.867	0.973	0.944	0.881	0.892	0.940
160	ZBR-5	13	1.870	3.838	6	1.846	0.167	4.250	0.606	–	0.766	0.771	–	–	–	–	–	–	0.959

APPENDIX17(1): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1	H 35 ALF-1		–	–	–	–	–
2	1	Fj	2	1.500	1.532	0.653	1
3	2	Zr	2	0.833	1.021	0.979	2
4	3	So	3	1.083	0.638	1.567	3
5	4	Tg 1	3	1.833	0.893	1.119	4
6	5	Tg 2	4	3.333	0.893	1.119	4
7	6	Rf	2	1.333	1.404	0.712	5
8	7	Bd	1	0.333	1.532	0.653	5
9	8	Kc	1	0.250	1.532	0.653	5
10	9	Dk 1	1	0.250	1.532	0.653	5
11	10	Ms	1	0.250	1.532	0.653	5
12	11	Dk 2	1	0.500	2.042	0.490	6
13	12	Os	1	0.500	2.170	0.461	0
14	H61 ALF-2		–	–	–	–	–
15	1	Zr	3	1.833	0.910	1.098	1
16	2	So	3	0.867	0.607	1.648	2
17	3	Dk 1	1	0.333	1.442	0.694	2
18	4	Bn	3	1.833	0.910	1.098	3
19	5	Tg	5	3.667	0.683	1.464	3
20	6	Bd 1	1	0.333	1.442	0.694	4
21	7	Fl 1	2	1.333	1.366	0.732	4
22	8	Bd 2	1	0.200	1.214	0.824	4
23	9	Kc	1	0.200	1.214	0.824	4
24	10	Fl 2	3	2.200	1.062	0.941	4
25	11	St	1	0.200	1.214	0.824	4
26	12	Dk 2	1	0.500	1.897	0.527	5
27	13	Dk 3	1	0.333	1.593	0.628	5
28	14	Dk 4	1	0.333	1.593	0.628	5
29	15	Sg	1	0.500	1.897	0.527	1
30	16	Os	2	1.333	1.366	0.732	0
31	H 100 ALF3		–	–	–	–	–
32	1	Sg	2	0.833	1.235	0.810	1
33	2	So 1	2	1.000	1.876	0.533	1
34	3	So 2	3	1.143	0.914	1.094	2
35	4	So 3	2	1.000	1.876	0.533	2
36	5	Rf 1	7	5.167	0.705	1.418	3
37	6	Zr 1	2	0.833	1.235	0.810	3
38	7	Zr 2	2	1.000	1.555	0.643	3
39	8	Tg	3	2.143	1.042	0.960	4
40	9	Dk 1	1	0.143	1.106	0.904	4
41	10	Dk 2	1	0.143	1.106	0.904	4
42	11	Dk 3	1	0.143	1.106	0.904	4
43	12	St	1	0.143	1.106	0.904	4
44	13	Bn	2	0.393	0.754	1.327	4
45	14	Md	1	0.333	1.443	0.693	5
46	15	Bd 1	1	0.333	1.443	0.693	5
47	16	Fr	4	2.083	0.834	1.199	5
48	17	Fl	3	1.583	1.106	0.904	6
49	18	Dk 4	1	0.250	1.235	0.810	6
50	19	Ts 1	4	3.250	1.138	0.878	6
51	20	Dk 5	1	0.333	1.507	0.664	7
52	21	Ts 2	3	2.333	1.443	0.693	7
53	22	Wk	1	0.250	1.539	0.650	7
54	23	Dk 6	1	0.250	1.539	0.650	7
55	24	Dk 7	1	0.250	1.539	0.650	7
56	25	Bd 2	1	0.333	1.844	0.542	8
57	26	Mw	1	0.333	1.844	0.542	8
58	27	Os	2	1.000	1.555	0.643	0
59	H82 ALF-4		–	–	–	–	–
60	1	Kg	4	2.500	1.410	0.709	1
61	2	Dk 1	2	1.250	1.796	0.557	2
62	3	Dk 2	2	1.250	1.796	0.557	2
63	4	Zr 1	2	0.750	1.178	0.849	2
64	5	Bd 1	1	0.500	2.221	0.450	3
65	6	Bd 2	1	0.500	2.221	0.450	3
66	7	Zr 2	2	0.667	0.985	1.015	3
67	8	Tg	6	4.333	0.831	1.204	4
68	9	St	1	0.167	1.255	0.797	5
69	10	Kc	1	0.167	1.255	0.797	5
70	11	Bn	2	0.500	0.946	1.057	5
71	12	Bd 3	1	0.167	1.255	0.797	5
72	13	Rf 1	3	2.167	1.178	0.849	5
73	14	Vr	3	1.250	1.101	0.908	6
74	15	Dk 3	1	0.333	1.603	0.624	6
75	16	Dk 4	1	0.333	1.603	0.624	6
76	17	Rf 2	2	0.833	1.449	0.690	7
77	18	Ts	4	3.333	1.410	0.709	7
78	19	Dk 5	2	1.500	1.835	0.545	8
79	20	Bd 4	1	0.250	1.835	0.545	8
80	21	Dk 6	1	0.250	1.835	0.545	8
81	22	Dk 7	1	0.250	1.835	0.545	8
82	23	Bd 5	1	0.500	2.260	0.443	9
83	24	Os	1	0.250	1.835	0.545	0
84	H 27 ALF-5		–	–	–	–	–
85	1	Zr 1	2	1.333	1.432	0.698	1
86	2	Zr 2	3	1.833	0.904	1.106	2
87	3	Dk1	1	0.333	1.582	0.632	3
88	4	Zr 3	3	1.167	0.678	1.475	3
89	5	Rf	2	1.333	1.206	0.829	4
90	6	Tg	3	1.833	0.904	1.106	4
91	7	Dk 2	1	0.500	1.884	0.531	5
92	8	Bd	2	1.333	1.432	0.698	5
93	9	Dk 3	1	0.333	1.582	0.632	5
94	10	Sr	1	0.500	2.110	0.474	6
95	11	Os	1	0.500	2.110	0.474	0

APPENDIX 17(2): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
96	H 63 ALF-6		–	–	–	–	–
97	1	Zr 1	2	1.333	1.913	0.523	1
98	2	Zr 2	3	2.000	1.469	0.681	2
99	3	Zr 3	2	0.667	1.162	0.861	3
100	4	Dk 1	1	0.333	1.981	0.505	3
101	5	Zr 4	3	1.500	0.922	1.084	4
102	6	Bn	2	0.667	1.230	0.813	5
103	7	Zr 5	2	0.667	1.025	0.976	5
104	8	Rf 1	3	2.500	1.606	0.623	6
105	9	Tg	3	1.750	1.196	0.836	6
106	10	Dk 2	1	0.333	2.118	0.472	7
107	11	Dk 3	1	0.333	2.118	0.472	7
108	12	Rf 2	4	3.333	1.503	0.665	7
109	13	Ms	1	0.333	1.708	0.585	7
110	14	DK 4	1	0.250	2.016	0.496	8
111	15	Dk 5	1	0.250	2.016	0.496	8
112	16	Dk 6	1	0.250	2.016	0.496	8
113	17	Os	1	0.500	2.426	0.412	0
114	H19 ALF-7		–	–	–	–	–
115	1	Zr 1	2	1.500	1.545	0.647	1
116	2	Zr 2	2	0.750	1.000	1.000	2
117	3	Tg	4	2.500	0.636	1.571	3
118	4	Rf 1	2	0.750	1.000	1.000	4
119	5	Rf 2	2	1.250	1.182	0.846	4
120	6	Bd	1	0.250	1.364	0.733	4
121	7	Dk 1	2	1.500	1.545	0.647	5
122	8	Dk 2	1	0.500	1.909	0.524	5
123	9	Dk 3	1	0.500	2.273	0.440	6
124	10	Os	1	0.500	2.273	0.440	0
125	H148 ALF-8		–	–	–	–	–
126	1	Zr 1	2	1.000	1.217	0.822	1
127	2	Zr 2	2	0.625	0.869	1.151	2
128	3	Tg 1	8	4.833	0.560	1.785	3
129	4	Bn	2	0.625	0.869	1.151	4
130	5	Ts	2	0.625	0.792	1.263	4
131	6	Rf 1	2	1.125	0.946	1.057	4
132	7	Rf 2	3	2.125	0.908	1.102	4
133	8	Bd 1	1	0.125	0.985	1.015	4
134	9	Dk1	1	0.125	0.985	1.015	4
135	10	Rf 3	2	1.125	0.946	1.057	4
136	11	Rf 4	2	1.000	1.217	0.822	5
137	12	Zr 3	2	0.833	1.062	0.941	5
138	13	Dk 2	1	0.500	1.371	0.729	5
139	14	Dk 3	1	0.333	1.333	0.750	5
140	15	Dk 4	1	0.333	1.333	0.750	5
141	16	Dk 5	1	0.500	1.371	0.729	5
142	17	Dk 6	2	1.500	1.603	0.624	6
143	18	Tg 2	3	2.000	1.371	0.729	6
144	19	Dk 6	1	0.500	2.028	0.493	7
145	20	Bd 2	1	0.333	1.796	0.557	7
146	21	Rf 5	2	1.333	1.758	0.569	7
147	22	Dk 7	1	0.500	2.183	0.458	8
148	23	Sg	1	0.500	2.028	0.493	1
149	24	Os	2	1.500	1.603	0.624	0
150	H24 SDK-1		–	–	–	–	–
151	1	Zr 1	2	1.333	1.818	0.550	1
152	2	Zr 2	3	2.000	1.273	0.786	2
153	3	Dk 3	1	0.333	2.000	0.500	3
154	4	Kg	2	0.833	1.091	0.917	3
155	5	Zr 3	2	0.833	1.091	0.917	4
156	6	Tg	3	2.000	1.273	0.786	5
157	7	Bd	1	0.333	2.000	0.500	6
158	8	Fl	2	1.333	1.818	0.550	6
159	9	Dk	1	0.500	2.545	0.393	7
160	10	Os	1	0.500	2.545	0.393	0
161	H60 SDK-2		–	–	–	–	–
162	1	Fj	2	1.500	1.954	0.512	1
163	2	Zr 1	2	1.000	1.487	0.673	2
164	3	Zr 2	2	1.000	1.105	0.905	3
165	4	Zr 3	2	0.667	0.807	1.239	4
166	5	Tg 1	6	3.833	0.595	1.681	5
167	6	Bd 1	1	0.167	1.147	0.872	6
168	7	Kc	1	0.167	1.147	0.872	6
169	8	Rf 1	2	1.167	1.062	0.942	6
170	9	Tg 2	2	1.167	1.062	0.942	6
171	10	Dk 1	3	2.167	0.977	1.023	6
172	11	Rf 2	1	0.500	1.614	0.619	7
173	12	Bd 2	1	0.500	1.614	0.619	7
174	13	Dk 2	1	0.333	1.529	0.654	7
175	14	Dk 3	1	0.333	1.529	0.654	7
176	15	Os	1	0.500	2.507	0.399	0

APPENDIX 17(3) :RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
177	H85	SDK-3	—	—	—	—	—
178	1	Kg 1	2	0.833	2.081	0.480	1
179	2	Zr 1	3	1.833	1.766	0.566	2
180	3	Zr 2	3	1.583	1.496	0.668	3
181	4	Dk 1	1	0.333	2.126	0.470	3
182	5	Dk 2	1	0.333	1.856	0.539	4
183	6	Ts 1	4	1.583	1.271	0.787	4
184	7	Bn	2	0.750	1.586	0.630	5
185	8	Zr 3	4	2.750	1.181	0.847	5
186	9	Tu 1	2	1.250	1.609	0.622	5
187	10	Kw	2	1.500	1.924	0.520	6
188	11	Dk 3	1	0.250	1.541	0.649	6
189	12	Zr 4	2	0.583	1.159	0.863	6
190	13	Dk 3	1	0.250	1.541	0.649	6
191	14	Bd 1	1	0.500	1.969	0.508	6
192	15	Dk 4	1	0.500	2.284	0.438	7
193	16	Kg 2	3	1.250	1.159	0.863	7
194	17	Zr 5	2	0.667	1.271	0.787	8
195	18	Tg 1	4	3.333	1.451	0.689	8
196	19	Sr	3	2.000	1.406	0.711	9
197	20	Dk 5	1	0.250	1.811	0.552	9
198	21	Dk 6	1	0.250	1.811	0.552	9
199	22	Bd 2	1	0.250	1.811	0.552	9
200	23	Md	1	0.333	1.766	0.566	10
201	24	Zr 6	2	0.583	1.586	0.630	10
202	25	So	4	1.833	1.789	0.559	11
203	26	Rf 1	2	1.250	2.126	0.470	12
204	27	Rf 2	2	1.250	2.126	0.470	12
205	28	Tg 2	3	2.250	2.104	0.475	12
206	29	Dk 7	1	0.500	2.486	0.402	13
207	30	Dk 8	1	0.500	2.486	0.402	13
208	31	Dk 9	1	0.333	2.464	0.406	13
209	32	Bd 3	1	0.333	2.464	0.406	13
210	33	Tu 2	1	0.500	2.779	0.360	1
211	34	Os	2	1.500	2.419	0.413	0
212	H145	SDK-4	—	—	—	—	—
213	1	So	2	1.500	1.556	0.643	1
214	2	Zr 1	2	0.700	1.132	0.884	2
215	3	Sm	5	3.250	0.764	1.309	3
216	4	Tg 1	4	3.200	1.075	0.930	4
217	5	Bd 1	1	0.200	1.245	0.803	4
218	6	Dk 1	1	0.200	1.245	0.803	4
219	7	Zr 2	2	0.700	0.792	1.262	4
220	8	Dk 2	1	0.250	1.556	0.643	5
221	9	Bd 2	1	0.250	1.556	0.643	5
222	10	Kj	1	0.250	1.556	0.643	5
223	11	Zr 3	2	0.643	0.877	1.140	5
224	12	Tg 2	7	6.500	1.019	0.982	6
225	13	Dk 3	1	0.143	1.500	0.667	7
226	14	Gk	1	0.143	1.500	0.667	7
227	15	Dk 4	1	0.143	1.500	0.667	7
228	16	Dk 5	1	0.143	1.500	0.667	7
229	17	Dk 6	1	0.143	1.500	0.667	7
230	18	Bd 3	1	0.143	1.500	0.667	7
231	19	Os	1	0.500	2.037	0.491	0
232	H 99	SDK5	—	—	—	—	—
233	1	Gr	2	0.500	1.236	0.809	1
234	2	Zr	2	0.500	1.236	0.809	1
235	3	Kg 1	3	1.833	1.120	0.893	1
236	4	Kg 2	6	4.333	0.946	1.057	2
237	5	Dk 1	1	0.333	1.545	0.647	2
238	6	Fkw	2	0.667	0.927	1.079	2
239	7	Bd 1	1	0.167	1.371	0.729	3
240	8	Dok 1	1	0.167	1.371	0.729	3
241	9	Dk 2	1	0.167	1.371	0.729	3
242	10	Kg 3	3	1.500	0.792	1.263	3
243	11	Ts 1	3	1.083	0.657	1.523	3
244	12	Dk 3	1	0.333	1.217	0.822	4
245	13	Ts 2	4	2.458	0.695	1.438	4
246	14	Tg	8	7.250	0.850	1.177	5
247	15	Dk 4	1	0.250	1.120	0.893	5
248	16	Dk 5	1	0.250	1.120	0.893	5
249	17	Dk 6	1	0.125	1.275	0.784	6
250	18	Dk 7	1	0.125	1.275	0.784	6
251	19	Bd 2	1	0.125	1.275	0.784	6
252	20	Dk 8	1	0.125	1.275	0.784	6
253	21	Dk9	1	0.125	1.275	0.784	6
254	22	Dok 2	1	0.125	1.275	0.784	6
255	23	Gk	1	0.125	1.275	0.784	6
256	24	Os	3	1.333	1.275	0.784	0

APPENDIX 17 (4):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
257	H72 SDK-6		—	—	—	—	—
258	1	Zr 1	2	1.500	2.235	0.447	1
259	2	Kg 1	2	1.000	1.811	0.552	2
260	3	Zr 2	2	1.000	1.443	0.693	3
261	4	Zr 3	2	0.833	1.132	0.884	4
262	5	Kg 2	3	1.333	0.877	1.140	5
263	6	Tg 1	2	1.333	1.302	0.768	6
264	7	Ts	3	1.476	0.792	1.262	6
265	8	Dk 1	1	0.500	1.783	0.561	7
266	9	Tg 2	7	5.667	0.821	1.219	7
267	10	Kj	1	0.333	1.273	0.785	7
268	11	Rf 1	3	2.143	1.188	0.841	8
269	12	Dk 2	1	0.143	1.302	0.768	8
270	13	Dk 3	1	0.143	1.302	0.768	8
271	14	Gk	1	0.143	1.302	0.768	8
272	15	Bd	1	0.143	1.302	0.768	8
273	16	Tg 3	1	0.143	1.302	0.768	8
274	17	Dk 4	1	0.333	1.669	0.599	9
275	18	Dk 5	1	0.333	1.669	0.599	9
276	19	Os	1	0.500	2.716	0.368	0
277	H129 SDK-7		—	—	—	—	—
278	1	Zr 1	2	1.500	1.242	0.805	1
279	2	So 1	2	0.700	0.879	1.138	2
280	3	Kg 1	5	1.867	0.545	1.834	3
281	4	So 2	3	1.700	0.818	1.223	4
282	5	Tg 1	5	3.700	0.788	1.270	4
283	6	So 3	3	1.450	0.757	1.320	4
284	7	So 4	2	0.400	0.788	1.270	4
285	8	Bd 1	1	0.333	1.212	0.825	5
286	9	Tg 2	2	0.833	1.151	0.869	5
287	10	Dk 1	1	0.200	1.182	0.846	5
288	11	Gk	1	0.200	1.182	0.846	5
289	12	Bd 1	1	0.200	1.182	0.846	5
290	13	Rf 1	2	1.200	1.151	0.869	5
291	14	Sg	1	0.333	1.151	0.869	5
292	15	Tg 3	4	2.833	1.030	0.971	5
293	16	Tg 4	5	4.500	1.060	0.943	5
294	17	Rf 2	2	1.500	1.515	0.660	6
295	18	Dk 2	1	0.500	1.545	0.647	6
296	19	Bd 2	1	0.250	1.424	0.702	6
297	20	Rf 3	2	1.250	1.394	0.718	6
298	21	Dk 3	1	0.250	1.424	0.702	6
299	22	Dk 4	1	0.200	1.454	0.688	6
300	23	Dk 5	1	0.200	1.454	0.688	6
301	24	Dk 6	1	0.200	1.454	0.688	6
302	25	Bd 3	1	0.200	1.454	0.688	6
303	26	Dk 7	1	0.500	1.909	0.524	7
304	27	Dk 8	1	0.500	1.787	0.559	7
305	28	Os	1	0.500	1.636	0.611	0
306	H 5 SDK-8		—	—	—	—	—
307	1	Zr 1	2	1.500	1.570	0.637	1
308	2	Md	2	0.833	0.981	1.019	2
309	3	Tg	3	2.000	0.785	1.274	3
310	4	Bd	1	0.333	1.766	0.566	4
311	5	Rf	2	1.333	1.374	0.728	4
312	6	Dk	1	0.500	2.355	0.425	4
313	7	Os	1	0.500	2.552	0.392	5
314	H80 SHS-1		—	—	—	—	—
315	1	Zr 1	2	1.500	2.067	0.484	1
316	2	Zr 2	2	1.000	1.667	0.600	2
317	3	Zr 3	2	0.833	1.311	0.763	3
318	4	Tg 1	3	1.700	1.000	1.000	4
319	5	Tg 2	5	2.583	0.778	1.286	5
320	6	Tk	1	0.333	1.444	0.692	5
321	7	Fl 1	2	1.200	1.178	0.849	6
322	8	Bn	2	0.533	0.911	1.098	6
323	9	Dg	1	0.200	1.222	0.818	6
324	10	Ts	4	3.200	1.089	0.918	6
325	11	Dk 1	1	0.500	1.622	0.616	7
326	12	Rf 1	3	2.000	1.089	0.918	7
327	13	St	1	0.250	1.533	0.652	7
328	14	Bd 1	1	0.250	1.533	0.652	7
329	15	Mw	1	0.250	1.533	0.652	7
330	16	Bd 2	1	0.333	1.533	0.652	8
331	17	Kw 1	2	0.583	1.356	0.738	8
332	18	Fl 2	4	3.500	1.667	0.600	9
333	19	Dk 2	1	0.250	2.111	0.474	10
334	20	Dk 3	1	0.250	2.111	0.474	10
335	21	Kw 2	1	0.250	2.111	0.474	10
336	22	Os	1	0.500	2.511	0.398	0
337	H 17 SHS-2		—	—	—	—	—
338	1	ZR 1	2	1.500	1.578	0.634	1
339	2	Zr 2	2	0.833	1.015	0.986	2
340	3	Tg	3	1.200	0.676	1.478	3
341	4	Bd	2	0.533	1.015	0.986	4
342	5	Fl	5	3.833	0.676	1.478	4
343	6	Dk 1	1	0.200	1.466	0.682	5
344	7	Dk 2	1	0.200	1.466	0.682	5
345	8	Dk 3	1	0.200	1.466	0.682	5
346	9	Os	1	0.500	2.367	0.422	0

APPENDIX 17(5):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
347	H 1	SHS-3	–	–	–	–	–
348	1	Zr	2	1.500	1.570	0.637	1
349	2	So	2	0.833	0.981	1.019	2
350	3	Tg	3	2.000	0.785	1.274	3
351	4	Fl	2	1.333	1.374	0.728	4
352	5	Bd	1	0.333	1.766	0.566	4
353	6	Dk	1	0.500	2.355	0.425	5
354	7	Os	1	0.500	2.552	0.392	0
355	H 95	SHS-4	–	–	–	–	–
356	1	Zr 1	3	2.000	1.325	0.755	1
357	2	Zr 2	2	0.667	1.273	0.786	2
358	3	Tr	2	0.583	1.065	0.939	2
359	4	So 1	3	1.250	0.935	1.069	3
360	5	So 2	4	1.667	0.727	1.375	3
361	6	Bn 1	2	0.833	1.299	0.770	4
362	7	So 3	2	0.583	0.883	1.132	4
363	8	Rf 1	3	1.750	1.039	0.962	4
364	9	Rf 2	2	1.500	1.715	0.583	5
365	10	Tg 1	3	1.750	1.091	0.916	5
366	11	Bn 2	2	1.333	1.455	0.687	5
367	12	Dk 1	1	0.333	1.507	0.664	5
368	13	Dk 2	1	0.500	2.182	0.458	6
369	14	Tg 2	4	3.333	1.403	0.713	6
370	15	Md	1	0.333	1.559	0.642	6
371	16	Dk 3	1	0.500	1.923	0.520	6
372	17	Bd	1	0.250	1.871	0.535	7
373	18	Dk 4	1	0.250	1.871	0.535	7
374	19	Dk 5	1	0.250	1.871	0.535	7
375	20	Os	1	0.333	1.793	0.558	0
376	H 81	SHS-5	–	–	–	–	–
377	1	Zr 1	2	1.500	2.482	0.403	1
378	2	Zr 2	2	1.000	2.089	0.479	2
379	3	Kg	2	1.000	1.737	0.576	3
380	4	So	2	1.000	1.427	0.701	4
381	5	Zr 3	2	0.833	1.158	0.863	5
382	6	Zr 4	3	1.250	0.931	1.075	6
383	7	Tg 1	4	2.533	1.075	0.930	7
384	8	Ts	2	0.667	1.075	0.930	7
385	9	Kc	1	0.250	1.510	0.662	8
386	10	Rf 1	5	4.250	1.344	0.744	8
387	11	Bd	1	0.250	1.510	0.662	8
388	12	Rf 2	3	1.833	1.261	0.793	8
389	13	Dk 1	1	0.200	1.778	0.562	9
390	14	Dk 2	1	0.200	1.778	0.562	9
391	15	Dk 3	1	0.200	1.778	0.562	9
392	16	DK 4	1	0.200	1.778	0.562	9
393	17	Dk 5	1	0.333	1.696	0.590	9
394	18	Bn	3	1.667	1.530	0.653	9
395	19	Dk 6	1	0.333	1.965	0.509	10
396	20	Rf 3	3	2.333	1.882	0.531	10
397	21	Dk 7	1	0.333	2.316	0.432	11
398	22	Dk 8	1	0.333	2.316	0.432	11
399	23	Os	1	0.500	2.916	0.343	0
400	H54	UGN-1	–	–	–	–	–
401	1	So 1	2	1.500	1.778	0.562	1
402	2	Zr 1	2	1.000	1.297	0.771	2
403	3	So 2	2	0.667	0.913	1.095	3
404	4	Tg	6	5.000	0.625	1.601	4
405	5	Bd	1	0.167	1.201	0.832	5
406	6	Kc	1	0.167	1.201	0.832	5
407	7	Bn	2	0.417	0.817	1.224	5
408	8	Dk 1	1	0.167	1.201	0.832	5
409	9	Dk 2	1	0.167	1.201	0.832	5
410	10	Rf	4	3.500	1.105	0.905	6
411	11	St	1	0.250	1.682	0.595	7
412	12	Bd 2	1	0.250	1.682	0.595	7
413	13	Dk 3	1	0.250	1.682	0.595	7
414	14	Os	1	0.500	2.355	0.425	0

APPENDIX17(6):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
415	H103	UGN2	–	–	–	–	–
416	1	Zr 1	3	2.500	1.429	0.700	1
417	2	So	2	0.458	1.135	0.881	2
418	3	St 1	1	0.333	1.754	0.570	2
419	4	Tg 1	8	5.583	0.857	1.167	3
420	5	St 2	1	0.125	1.183	0.846	4
421	6	Dk 1	1	0.125	1.183	0.846	4
422	7	Bn	3	1.625	1.135	0.881	4
423	8	Dk 2	1	0.125	1.183	0.846	4
424	9	Ts 1	4	2.625	1.119	0.894	4
425	10	Dk 3	1	0.125	1.183	0.846	4
426	11	Zr 2	2	0.625	0.802	1.248	4
427	12	Fl 1	2	1.333	1.444	0.692	5
428	13	Bd 1	1	0.333	1.460	0.685	5
429	14	Dk 4	1	0.250	1.444	0.692	5
430	15	Bd 2	1	0.250	1.444	0.692	5
431	16	Fl 2	2	1.250	1.429	0.700	5
432	17	Zr 3	2	0.600	0.762	1.312	5
433	18	Dk 5	1	0.500	1.770	0.565	6
434	19	Dk 6	1	0.500	1.754	0.570	6
435	20	Tg 2	10	6.333	0.738	1.355	6
436	21	Fl 3	2	1.100	1.048	0.955	7
437	22	Fl 4	2	1.100	1.048	0.955	7
438	23	Dk 7	1	0.100	1.064	0.940	7
439	24	Rf 1	1	0.100	1.064	0.940	7
440	25	Bd 3	1	0.100	1.064	0.940	7
441	26	Bn 2	3	0.683	0.905	1.105	7
442	27	Bn 3	2	0.350	0.984	1.016	7
443	28	Kj	2	0.600	1.048	0.955	7
444	29	Ts 2	2	0.600	1.048	0.955	7
445	30	Dk 8	1	0.500	1.373	0.728	8
446	31	Dk 9	1	0.500	1.373	0.728	8
447	32	Rf 2	3	1.333	1.167	0.857	8
448	33	Ts 3	4	1.833	1.151	0.869	8
449	34	Kc	2	1.000	1.357	0.737	8
450	35	Fl 5	2	1.333	1.476	0.677	9
451	36	Ts 4	2	1.333	1.476	0.677	9
452	37	Fl 6	2	1.250	1.460	0.685	9
453	38	Fl 7	2	1.250	1.460	0.685	9
454	39	Dk 10	1	0.500	1.802	0.555	10
455	40	Bd 4	1	0.500	1.802	0.555	10
456	41	Dk 11	1	0.500	1.786	0.560	10
457	42	Dk 12	1	0.500	1.786	0.560	10
458	43	Os	1	0.333	1.754	0.570	0
459	H49	UGN3	–	–	–	–	–
460	1	Zr 1	2	1.500	1.870	0.535	1
461	2	Zr 2	2	1.000	1.375	0.727	2
462	3	Zr 3	2	0.750	0.990	1.010	3
463	4	Tg 1	4	2.750	0.715	1.399	4
464	5	Dk 1	1	0.250	1.320	0.758	5
465	6	Tg 2	4	2.250	0.770	1.299	5
466	7	Kc	1	0.250	1.320	0.758	5
467	8	Rf 1	2	1.250	1.265	0.791	6
468	9	Bd	1	0.250	1.375	0.727	6
469	10	Rf 2	2	1.250	1.265	0.791	6
470	11	Dk 2	1	0.500	1.870	0.535	7
471	12	Dk 3	1	0.500	1.870	0.535	7
472	13	Os	1	0.500	2.474	0.404	0
473	H25	UGN4	–	–	–	–	–
474	1	Zr 1	2	1.500	1.636	0.611	1
475	2	Zr 2	2	1.000	1.091	0.917	2
476	3	Ts	2	0.667	0.727	1.375	3
477	4	Tg	6	5.500	0.545	1.833	4
478	5	Dk 1	1	0.167	1.273	0.786	5
479	6	Dk 2	1	0.167	1.273	0.786	5
480	7	Dk 3	1	0.167	1.273	0.786	5
481	8	Bd	1	0.167	1.273	0.786	5
482	9	Kc	1	0.167	1.273	0.786	5
483	10	Os	1	0.500	2.364	0.423	0
484	H 41	UGN5	–	–	–	–	–
485	1	So 1	2	1.500	1.276	0.783	1
486	2	So 2	2	0.667	0.766	1.306	2
487	3	Tg 1	6	4.750	0.383	2.612	3
488	4	Dk 1	1	0.167	1.021	0.979	4
489	5	Dk 2	1	0.167	1.021	0.979	4
490	6	Dk 3	1	0.167	1.021	0.979	4
491	7	Bd	1	0.167	1.021	0.979	4
492	8	Tg 2	4	3.167	0.638	1.567	4
493	9	St	1	0.250	1.276	0.783	5
494	10	Kc	1	0.250	1.276	0.783	5
495	11	Dk 4	1	0.250	1.276	0.783	5
496	12	Os	1	0.500	1.915	0.522	0

APPENDIX 17(7): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
497	H125	UGN	—	—	—	—	—
498	1	So 1	2	1.333	1.606	0.623	1
499	2	So 2	3	2.000	1.162	0.861	2
500	3	Sg	1	0.333	1.674	0.597	3
501	4	So 3	2	0.500	0.854	1.171	3
502	5	Tg 1	6	4.333	0.615	1.626	4
503	6	Fl 1	2	1.167	1.059	0.944	5
504	7	Sr	1	0.167	1.127	0.887	5
505	8	Dk 1	1	0.167	1.127	0.887	5
506	9	Bd	1	0.167	1.127	0.887	5
507	10	Ts	3	1.500	0.786	1.273	5
508	11	Dk 2	1	0.500	1.572	0.636	6
509	12	Dk 3	1	0.333	1.298	0.770	6
510	13	Tg 2	3	1.833	1.093	0.915	6
511	14	Dk 4	1	0.333	1.606	0.623	7
512	15	Fl 2	2	1.333	1.537	0.650	7
513	16	Dk 5	1	0.500	2.050	0.488	8
514	17	Os	1	0.500	2.118	0.472	0
515	H 11	UGN7	—	—	—	—	—
516	1	Zr	2	1.500	1.240	0.806	1
517	2	Ts	2	0.667	0.676	1.478	2
518	3	Tg	6	5.500	0.338	2.957	3
519	4	Bd	1	0.167	1.127	0.887	4
520	5	Dk 1	1	0.167	1.127	0.887	4
521	6	Dk 2	1	0.167	1.127	0.887	4
522	7	Kc	1	0.167	1.127	0.887	4
523	8	Dk 3	1	0.167	1.127	0.887	4
524	9	Os	1	0.500	2.029	0.493	0
525	H138	UGN8	—	—	—	—	—
526	1	Zr 1	3	2.500	0.935	1.070	1
527	2	Zr 2	2	0.444	0.550	1.819	2
528	3	Bd1	1	0.333	1.540	0.649	2
529	4	Tg	9	8.500	0.275	3.637	3
530	5	Dk 1	1	0.111	0.880	1.137	4
531	6	Kc	1	0.111	0.880	1.137	4
532	7	Bd 2	1	0.111	0.880	1.137	4
533	8	Dk 2	1	0.111	0.880	1.137	4
534	9	Dk 3	1	0.111	0.880	1.137	4
535	10	Dk 4	1	0.111	0.880	1.137	4
536	11	Dk 5	1	0.111	0.880	1.137	4
537	12	Dk 6	1	0.111	0.880	1.137	4
538	13	Os	1	0.333	1.540	0.649	0
539	H 73	YKS-1	—	—	—	—	—
540	1	Zr 1	2	1.500	2.207	0.453	1
541	2	Zr 2	2	0.833	1.783	0.561	2
542	3	Kg	3	2.000	1.415	0.707	3
543	4	So 1	2	0.833	1.160	0.862	4
544	5	Bd 1	1	0.333	1.896	0.527	4
545	6	Zr 3	2	0.833	0.962	1.039	5
546	7	So 2	3	1.000	0.821	1.219	6
547	8	Bn	3	1.833	1.132	0.884	7
548	9	Tg	6	4.833	0.962	1.039	7
549	10	Rf 1	2	1.333	1.556	0.643	8
550	11	Dk 1	1	0.333	1.613	0.620	8
551	12	Dk 2	1	0.167	1.443	0.693	8
552	13	Dk 3	1	0.167	1.443	0.693	8
553	14	Bd 2	1	0.167	1.443	0.693	8
554	15	Kc	1	0.167	1.443	0.693	8
555	16	Rf 2	2	1.167	1.387	0.721	8
556	17	Dk 4	1	0.500	2.037	0.491	9
557	18	Dk 5	1	0.500	1.868	0.535	9
558	19	Os	1	0.500	2.688	0.372	0
559	H119	YKS-2	—	—	—	—	—
560	1	Zr 1	2	1.500	1.490	0.671	1
561	2	Zr 2	2	0.833	1.009	0.991	2
562	3	Zr 3	3	1.033	0.625	1.601	3
563	4	Tg	5	3.667	0.625	1.601	4
564	5	Ts 1	3	2.333	1.009	0.991	4
565	6	Dk 1	1	0.200	1.201	0.832	5
566	7	Dk 2	1	0.200	1.201	0.832	5
567	8	Dk 3	1	0.200	1.201	0.832	5
568	9	Ts 2	3	2.200	1.009	0.991	5
569	10	Dk 4	1	0.333	1.586	0.631	5
570	11	Dk 5	1	0.333	1.586	0.631	5
571	12	Bd	1	0.333	1.586	0.631	6
572	13	Kc	1	0.333	1.586	0.631	6
573	14	Os	1	0.500	2.066	0.484	0

APPENDIX17(8):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
574	H130	YKS-3	—	—	—	—	—
575	1	Fr	3	2.000	1.474	0.679	1
576	2	Zr 1	2	0.833	1.564	0.640	2
577	3	Zr 2	2	0.833	1.429	0.700	2
578	4	Zr 3	2	1.000	1.676	0.597	3
579	5	Zr 4	2	1.000	1.406	0.711	3
580	6	Ts 1	2	0.700	1.811	0.552	4
581	7	Ts 2	2	0.643	1.406	0.711	4
582	8	Tg 1	5	3.333	1.969	0.508	5
583	9	Tg 2	7	4.833	1.429	0.700	5
584	10	Bn 1	2	1.200	2.306	0.434	6
585	11	Bn 2	3	1.700	2.239	0.447	6
586	12	Dk 1	1	0.200	2.329	0.429	6
587	13	Bd 1	1	0.200	2.329	0.429	6
588	14	Bd 2	1	0.143	1.789	0.559	6
589	15	Dk 2	1	0.143	1.789	0.559	6
590	16	Fl 1	2	1.143	1.766	0.566	6
591	17	Bn 3	3	1.476	1.699	0.589	6
592	18	Kc	1	0.143	1.789	0.559	6
593	19	Bn 4	2	0.476	1.699	0.589	6
594	20	Dk 3	1	0.500	2.666	0.375	7
595	21	Ts 3	2	0.833	2.554	0.392	7
596	22	Bd 3	1	0.333	2.599	0.385	7
597	23	Dk 4	1	0.500	2.126	0.470	7
598	24	Rf 1	3	2.333	2.014	0.497	7
599	25	Bd 4	1	0.333	2.059	0.486	7
600	26	Fl 2	3	2.000	1.991	0.502	7
601	27	Rf 2	2	1.500	2.891	0.346	8
602	28	Dk 5	1	0.333	2.374	0.421	8
603	29	Dk 6	1	0.333	2.374	0.421	8
604	30	Bd 5	1	0.333	2.351	0.425	8
605	31	Dk 7	2	1.333	2.329	0.429	8
606	32	Dk 8	1	0.500	3.251	0.308	9
607	33	Kw	1	0.500	2.689	0.372	9
608	34	Os	1	0.333	1.834	0.545	0
609	H105	YKS-4	—	—	—	—	—
610	1	Zr	3	2.500	1.160	0.862	1
611	2	Dk 1	1	0.333	2.030	0.493	2
612	3	So	2	0.667	0.870	1.149	2
613	4	Tg	3	2.000	0.870	1.149	3
614	5	Fl	2	1.333	1.450	0.690	4
615	6	Bd	1	0.333	1.740	0.575	4
616	7	Dk 2	1	0.500	2.320	0.431	5
617	8	Os	1	0.333	2.030	0.493	0
618	H137	YKS-5	—	—	—	—	—

619	1	Zr	3	2.000	1.275	0.785	1
620	2	So 1	2	0.833	1.317	0.759	2
621	3	So 2	2	0.833	1.402	0.713	2
622	4	So 3	2	1.000	1.444	0.692	3
623	5	Ts1	2	0.750	1.614	0.619	3
624	6	Ts 2	2	0.750	1.657	0.604	4
625	7	Tg 1	4	3.500	1.912	0.523	4
626	8	Tg 2	4	3.500	1.954	0.512	5
627	9	Bd 1	1	0.250	2.464	0.406	5
628	10	Dk 1	1	0.250	2.464	0.406	5
629	11	Dk 2	1	0.250	2.464	0.406	5
630	12	Dk 3	1	0.250	2.507	0.399	6
631	13	Dk 4	1	0.250	2.507	0.399	6
632	14	Bd 2	1	0.250	2.507	0.399	6
633	15	Os	1	0.333	1.827	0.547	0
634	H133	ZNG-1	—	—	—	—	—
635	1	Zr 1	2	1.000	1.103	0.907	1
636	2	Zr 2	4	2.250	0.791	1.264	1
637	3	Zr 3	2	0.700	1.007	0.993	2
638	4	Dk 1	1	0.250	1.247	0.802	2
639	5	Zr 4	2	0.450	0.695	1.438	2
640	6	Tg 1	4	3.250	1.103	0.907	2
641	7	Tg 2	5	3.700	0.791	1.264	3
642	8	Tg 3	5	2.200	0.599	1.668	3
643	9	Dk 2	1	0.250	1.558	0.642	3
644	10	Dk 3	1	0.250	1.558	0.642	3
645	11	Bd 1	1	0.250	1.558	0.642	3
646	12	Dk 4	1	0.200	1.247	0.802	4
647	13	Dk 5	1	0.200	1.247	0.802	4
648	14	Bd 2	1	0.200	1.247	0.802	4
649	15	Rf 1	2	1.200	1.007	0.993	4
650	16	Rf 2	2	1.200	1.007	0.993	4
651	17	Kc	2	1.200	1.007	0.993	4
652	18	Dk 6	1	0.500	1.462	0.684	5
653	19	Dk 7	1	0.500	1.462	0.684	5
654	20	Bd 3	1	0.500	1.462	0.684	5
655	21	Os	2	0.750	1.055	0.948	0

APPENDIX 17(9):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
656	H144 ZNG-2		—	—	—	—	—
657	1	Zr 1	3	2.500	1.364	0.733	1
658	2	Sg	1	0.333	1.860	0.538	2
659	3	Fr	2	0.583	0.992	1.008	2
660	4	Tg 1	4	2.083	0.682	1.467	3
661	5	Bn	3	1.583	0.930	1.076	4
662	6	Tg 2	4	2.750	0.806	1.241	4
663	7	Bd	1	0.250	1.178	0.849	4
664	8	Rf 1	3	2.333	1.302	0.768	5
665	9	Dk 1	1	0.333	1.426	0.701	5
666	10	Dk 2	1	0.250	1.302	0.768	5
667	11	Tg 3	2	0.583	1.116	0.896	5
668	12	Kc	1	0.250	1.302	0.768	5
669	13	Dk 3	1	0.333	1.798	0.556	6
670	14	Dk 4	1	0.333	1.798	0.556	6
671	15	Rf 2	3	2.500	1.488	0.672	6
672	16	Dk 5	1	0.333	1.983	0.504	7
673	17	Dk 6	1	0.333	1.983	0.504	7
674	18	Os	1	0.333	1.860	0.538	0
675	H155 ZNG-3		—	—	—	—	—
676	1	Zr 1	2	1.500	1.353	0.739	1
677	2	Zr 2	2	1.000	1.057	0.946	2
678	3	Ts 1	2	0.611	0.775	1.291	3
679	4	Kg 1	9	4.783	0.506	1.978	4
680	5	Kg 2	4	2.111	0.670	1.493	5
681	6	Zr 3	2	0.361	0.722	1.384	5
682	7	Md 1	1	0.111	0.814	1.228	5
683	8	Md 2	1	0.111	0.814	1.228	5
684	9	Zr 4	2	0.361	0.735	1.360	5
685	10	Zr 5	2	0.361	0.762	1.313	5
686	11	Tg 1	5	3.611	0.749	1.336	5
687	12	Tg 2	3	1.611	0.775	1.291	5
688	13	Zr 6	2	0.450	0.913	1.096	6
689	14	Bd 1	1	0.250	0.978	1.022	6
690	15	Zr 7	2	0.583	0.939	1.065	6
691	16	Tg 3	4	2.750	0.952	1.050	6
692	17	Tg 4	4	2.833	0.978	1.022	6
693	18	Tg 5	4	3.500	1.031	0.970	6
694	19	Dk 1	1	0.200	1.057	0.946	6
695	20	Kc 1	1	0.200	1.057	0.946	6
696	21	Bd 2	1	0.200	1.057	0.946	6
697	22	Rf 1	2	1.200	1.044	0.958	6
698	23	Rf 2	2	1.333	1.070	0.934	6
699	24	Bd 3	1	0.333	1.083	0.923	6
700	25	Tg 6	5	4.500	1.169	0.856	7
701	26	Tg 7	3	2.500	1.221	0.819	7
702	27	Dk 2	1	0.250	1.261	0.793	7
703	28	Dk 3	1	0.250	1.261	0.793	7
704	29	Ts 3	4	3.250	1.221	0.819	7
705	30	Bd 4	1	0.250	1.287	0.777	7
706	31	Rf 3	3	2.250	1.261	0.793	7
707	32	Dk 4	1	0.250	1.287	0.777	7
708	33	Dk 5	1	0.250	1.340	0.747	7
709	34	Dk 6	1	0.250	1.340	0.747	7
710	35	Bd 5	1	0.250	1.340	0.747	7
711	36	Dk 7	1	0.500	1.353	0.739	7
712	37	Dk 8	1	0.500	1.379	0.725	7
713	38	Dk 9	1	0.200	1.477	0.677	8
714	39	Dk 10	1	0.200	1.477	0.677	8
715	40	Kc 2	1	0.200	1.477	0.677	8
716	41	Bd 6	1	0.200	1.477	0.677	8
717	42	Dk 11	1	0.333	1.530	0.654	8
718	43	Dk 12	1	0.333	1.530	0.654	8
719	44	Md 3	1	0.250	1.530	0.654	8
720	45	Bd 7	1	0.250	1.530	0.654	8
721	46	Dk 13	1	0.250	1.530	0.654	8
722	47	Dk 14	1	0.333	1.569	0.637	8
723	48	Dk 15	1	0.333	1.569	0.637	8
724	49	Os	1	0.500	1.661	0.602	0
725	H 71 ZNG-4		—	—	—	—	—
726	1	Zr	3	2.500	1.519	0.658	1
727	2	Sg	1	0.333	2.014	0.496	1
728	3	Kg	2	0.833	1.147	0.872	2
729	4	Tg 1	2	0.700	0.837	1.195	3
730	5	So	5	3.167	0.589	1.698	4
731	6	Dk 1	1	0.200	1.085	0.922	5
732	7	Tg 2	6	4.533	0.651	1.536	5
733	8	Rf1	2	1.200	1.023	0.978	5
734	9	Dk 2	1	0.200	1.085	0.922	5
735	10	Dk 3	1	0.167	1.147	0.872	6
736	11	Bd	1	0.167	1.147	0.872	6
737	12	Rf 2	3	2.167	1.023	0.978	6
738	13	Dk 4	1	0.167	1.147	0.872	6
739	14	Dk 5	1	0.167	1.147	0.872	6
740	15	Dk 6	1	0.500	1.519	0.658	6
741	16	Dk 7	1	0.333	1.519	0.658	7
742	17	Dk 8	1	0.333	1.519	0.658	7
743	18	Os	1	0.333	2.014	0.496	0

APPENDIX 17 (10):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
744	H 34 ZNG-5		—	—	—	—	—
745	1	Zr 1	2	1.500	2.411	0.415	1
746	2	Zr 2	2	1.000	1.884	0.531	2
747	3	Zr 3	2	1.000	1.507	0.664	3
748	4	Zr 4	2	1.000	1.281	0.781	4
749	5	Md	2	0.833	1.206	0.829	5
750	6	Tg	3	1.833	1.281	0.781	6
751	7	Bd	1	0.333	1.959	0.510	7
752	8	Rf	3	2.333	1.658	0.603	7
753	9	Dk 1	1	0.333	2.336	0.428	8
754	10	Dk 2	1	0.333	2.336	0.428	8
755	11	Os	1	0.500	3.090	0.324	0
756	H 26 ZNG-6		—	—	—	—	—
757	1	Zr 1	2	1.500	1.636	0.611	1
758	2	Zr 2	2	0.750	1.091	0.917	2
759	3	Tg	4	3.000	0.727	1.375	3
760	4	Rf	2	0.583	0.909	1.100	4
761	5	Md	1	0.250	1.455	0.688	4
762	6	Bd	1	0.250	1.455	0.688	4
763	7	Fl	3	2.500	1.273	0.786	5
764	8	Dk 1	1	0.333	2.000	0.500	6
765	9	Dk 2	1	0.333	2.000	0.500	6
766	10	Os	1	0.500	2.364	0.423	0
767	H 50 BZW1		—	—	—	—	—
768	1	Zr	2	1.000	1.730	0.578	1
769	2	So 1	2	1.000	1.345	0.743	2
770	3	So 2	2	0.750	1.057	0.946	3
771	4	Tg	4	2.750	0.865	1.156	4
772	5	Dk 1	1	0.250	1.442	0.694	5
773	6	Rf 1	4	2.750	0.961	1.041	5
774	7	Bd	1	0.250	1.442	0.694	5
775	8	Dk 2	1	0.250	1.538	0.650	6
776	9	Bn	2	0.750	1.345	0.743	6
777	10	Dk 3	1	0.250	1.538	0.650	6
778	11	Rf 2	2	1.500	1.826	0.548	7
779	12	Dk 4	1	0.500	2.403	0.416	8
780	13	Sg	1	0.500	2.787	0.359	1
781	14	Os	2	1.500	2.210	0.452	0
782	H 67 BZW2		—	—	—	—	—
783	1	Zr 1	2	1.500	1.705	0.587	1
784	2	Zr 2	2	0.833	1.271	0.787	2
785	3	Sr	3	1.750	0.899	1.113	3
786	4	Kc	1	0.333	1.395	0.717	4
787	5	Tg	4	1.917	0.651	1.536	4
788	6	Bn	4	2.083	0.713	1.403	5
789	7	Bd 1	1	0.250	1.147	0.872	5
790	8	Rf 1	3	2.250	1.023	0.978	5
791	9	Dk 1	1	0.250	1.209	0.827	6
792	10	Cr	3	1.750	1.023	0.978	6
793	11	Rf 2	2	1.250	1.147	0.872	6
794	12	Dk 2	1	0.333	1.519	0.658	6
795	13	Dk 3	1	0.333	1.519	0.658	6
796	14	Rf 3	2	1.333	1.457	0.687	7
797	15	Bd 2	1	0.333	1.519	0.658	7
798	16	Dk 4	1	0.500	1.643	0.609	7
799	17	Dk 5	1	0.500	1.952	0.512	8
800	18	Os	1	0.500	2.200	0.454	0
801	H 12 BZW3		—	—	—	—	—
802	1	Zr 1	2	1.500	1.916	0.522	1
803	2	Zr 2	2	1.000	1.353	0.739	2
804	3	Zr 3	2	0.833	1.015	0.986	3
805	4	Tg	3	1.833	0.902	1.109	4
806	5	Bd	1	0.333	1.691	0.591	5
807	6	Rf	3	2.333	1.240	0.806	5
808	7	Dk 1	1	0.333	2.029	0.493	6
809	8	Dk 2	1	0.333	2.029	0.493	6
810	9	Os	1	0.500	2.706	0.370	0
811	H 4 BZW4		—	—	—	—	—
812	1	Zr	2	1.250	0.860	1.163	1
813	2	Tg	4	3.500	0.287	3.490	2
814	3	Dk 1	1	0.250	1.433	0.698	3
815	4	Dk 2	1	0.250	1.433	0.698	3
816	5	Bd	1	0.250	1.433	0.698	3
817	6	Os	1	0.500	2.006	0.499	0
818	H44 BZW5		—	—	—	—	—
819	1	Zr 1	3	2.500	1.540	0.649	1
820	2	Sr	1	0.333	2.145	0.466	2
821	3	Zr 2	2	0.833	1.155	0.866	2
822	4	Zr 3	2	0.750	0.880	1.137	3
823	5	Tg 1	4	2.250	0.715	1.399	4
824	6	Bd	1	0.250	1.320	0.758	5
825	7	Rf	4	3.250	0.990	1.010	5
826	8	Tg 2	2	1.250	1.210	0.827	5
827	9	Dk 1	1	0.250	1.595	0.627	6
828	10	Dk 2	1	0.250	1.595	0.627	6
829	11	Dk 3	1	0.250	1.595	0.627	6
830	12	Dk 4	1	0.500	1.815	0.551	6
831	13	Os	1	0.333	2.145	0.466	0

APPENDIX 17(11): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
832	H139	DBZ-1	–	–	–	–	–
833	1	Zr 1	2	1.250	1.395	0.717	1
834	2	Zr 2	4	2.750	0.961	1.041	2
835	3	Kc	1	0.250	1.457	0.687	3
836	4	Bd 1	1	0.250	1.457	0.687	3
837	5	Tg	4	1.750	0.713	1.403	3
838	6	Rf 1	2	1.250	1.147	0.872	4
839	7	Bn	2	0.500	0.775	1.291	4
840	8	Rf 2	2	1.250	1.147	0.872	4
841	9	Dk 1	1	0.500	1.643	0.609	5
842	10	Vr	4	2.333	0.899	1.113	5
843	11	Dk 2	1	0.500	1.643	0.609	5
844	12	Rf 3	3	2.250	1.271	0.787	6
845	13	Bd 2	1	0.250	1.395	0.717	6
846	14	Rf 4	2	1.250	1.333	0.750	6
847	15	Dk 3	1	0.333	1.767	0.566	7
848	16	Dk 4	1	0.333	1.767	0.566	7
849	17	Dk 5	1	0.500	1.829	0.547	7
850	18	Os	1	0.500	1.891	0.529	0
851	H153	DBZ-2	–	–	–	–	–
852	1	Zr 1	4	2.333	1.001	0.999	1
853	2	Zr 2	2	0.500	1.015	0.986	2
854	3	Zr 3	3	1.000	1.218	0.821	2
855	4	Zr 4	2	0.500	1.123	0.891	2
856	5	Kg	4	1.667	1.042	0.960	3
857	6	Tg 1	4	2.833	1.475	0.678	3
858	7	Sr l	2	1.333	1.515	0.660	3
859	8	Ts 1	4	2.667	1.258	0.795	3
860	9	Sr 2	2	1.250	1.339	0.747	4
861	10	Tg 3	3	1.750	1.285	0.778	4
862	11	Sr 3	3	1.450	1.191	0.840	4
863	12	Dk 1	1	0.250	1.786	0.560	4
864	13	Fl 1	2	1.250	1.772	0.564	4
865	14	Bd 1	1	0.250	1.786	0.560	4
866	15	Dk 2	1	0.500	1.826	0.548	4
867	16	Dk 3	1	0.250	1.569	0.637	4
868	17	Dk 4	1	0.250	1.569	0.637	4
869	18	Tg 4	6	4.750	1.434	0.697	4
870	19	Dk 5	1	0.500	1.651	0.606	5
871	20	Bd 2	1	0.333	1.596	0.626	5
872	21	Rf 1	2	0.667	1.556	0.643	5
873	22	Bd 3	1	0.333	1.502	0.666	5
874	23	Tg 5	5	3.333	1.366	0.732	5
875	24	Dk 6	1	0.500	2.083	0.480	5
876	25	Ts 2	2	0.417	1.678	0.596	5
877	26	Dk 7	1	0.167	1.745	0.573	5
878	27	Dk 8	1	0.167	1.745	0.573	5
879	28	Bd 4	1	0.167	1.745	0.573	5
880	29	Dk 9	1	0.167	1.745	0.573	5
881	30	Fl 2	3	2.500	1.840	0.543	6
882	31	Dk 10	1	0.200	1.678	0.596	6
883	32	Fl 3	2	1.200	1.664	0.601	6
884	33	Dk 11	1	0.200	1.678	0.596	6
885	34	Ts 3	2	0.533	1.610	0.621	6
886	35	Tg 6	4	3.000	1.935	0.517	6
887	36	Dk 12	1	0.333	2.151	0.465	7
888	37	Dk 13	1	0.333	2.151	0.465	7
889	38	Dk 14	1	0.500	1.975	0.506	7
890	39	Tg 7	3	1.833	1.867	0.536	7
891	40	Kc	1	0.250	2.246	0.445	7
892	41	Bd 5	1	0.250	2.246	0.445	7
893	42	Rf 2	2	1.250	2.232	0.448	7
894	43	Fl 4	3	2.333	2.151	0.465	8
895	44	Bd 6	1	0.333	2.178	0.459	8
896	45	Dk 15	1	0.500	2.543	0.393	8
897	46	Dk 16	1	0.333	2.462	0.406	9
898	47	Dk 17	1	0.333	2.462	0.406	9
899	48	Os	1	0.250	1.312	0.762	0
900	H 20	DBZ-3	–	–	–	–	–
901	1	Zr 1	2	1.333	1.273	0.786	1
902	2	Zr 2	3	1.333	0.727	1.375	2
903	3	Rf 1	2	1.333	1.273	0.786	3
904	4	Tg	3	1.333	0.727	1.375	3
905	5	Dk 1	1	0.500	2.000	0.500	4
906	6	Bd	2	1.333	1.273	0.786	4
907	7	Rf 2	2	1.333	1.273	0.786	4
908	8	Ms	1	0.500	2.000	0.500	5
909	9	Dk 2	1	0.500	2.000	0.500	5
910	10	Os	1	0.500	2.000	0.500	0
911	H135	DBZ-4	–	–	–	–	–
912	1	Zr 1	2	1.500	1.249	0.800	1
913	2	Zr 2	2	0.643	0.769	1.301	2
914	3	Tg	7	5.000	0.384	2.601	3
915	4	Rf 1	2	0.643	0.769	1.301	4
916	5	Ms	1	0.143	0.961	1.041	4
917	6	Kc	1	0.143	0.961	1.041	4
918	7	Sr	1	0.143	0.961	1.041	4
919	8	Rf 2	2	1.143	0.865	1.156	4
920	9	Dk 1	2	1.143	0.865	1.156	4
921	10	Dk 2	2	1.500	1.249	0.800	5
922	11	Dk 3	1	0.500	1.442	0.694	5
923	12	Dk 4	1	0.500	1.442	0.694	6
924	13	Os	1	0.500	1.826	0.548	0

APPENDIX17(12):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
925	H124	DBZ-5	–	–	–	–	–
926	1	Zr 1	3	2.333	1.537	0.650	1
927	2	Dk 1	1	0.333	2.050	0.488	2
928	3	Kg	3	1.833	1.162	0.861	2
929	4	So	2	0.533	0.922	1.084	3
930	5	Bd	1	0.333	1.674	0.597	3
931	6	Tg	5	3.333	0.752	1.331	4
932	7	Kc	1	0.200	1.264	0.791	5
933	8	Ms	1	0.200	1.264	0.791	5
934	9	Rf 1	2	1.200	1.196	0.836	5
935	10	Fl	3	1.700	0.922	1.084	5
936	11	Dk 2	1	0.500	1.708	0.585	6
937	12	Dk 3	1	0.333	1.435	0.697	6
938	13	Bn	2	0.667	1.230	0.813	6
939	14	Rf 2	3	2.500	1.606	0.623	7
940	15	Dk 4	1	0.333	2.118	0.472	8
941	16	Dk 5	1	0.333	2.118	0.472	8
942	17	Os	1	0.333	2.050	0.488	0
943	H148	DRM1	–	–	–	–	–
944	1	Zr 1	2	1.500	1.378	0.726	1
945	2	Zr 2	2	0.700	1.004	0.996	2
946	3	Kg	5	2.583	0.663	1.507	3
947	4	Rf 1	2	1.200	1.038	0.964	4
948	5	Sr 1	3	0.950	0.766	1.306	4
949	6	Tg 1	4	2.033	0.800	1.251	4
950	7	Bd 1	1	0.200	1.072	0.933	4
951	8	Dk 1	1	0.500	1.446	0.692	5
952	9	Rf 2	2	1.333	1.140	0.877	5
953	10	Tg 2	4	2.167	0.970	1.031	5
954	11	Bd 2	1	0.250	1.208	0.828	5
955	12	Bn	2	0.750	1.106	0.904	5
956	13	Rf 3	3	2.250	1.140	0.877	5
957	14	Dk 2	1	0.500	1.548	0.646	6
958	15	Sr 2	2	1.250	1.344	0.744	6
959	16	Dk 3	1	0.250	1.378	0.726	6
960	17	Ts	3	2.250	1.310	0.763	6
961	18	Kw	2	1.000	1.446	0.692	6
962	19	Dk 4	1	0.333	1.548	0.646	6
963	20	Dk 5	1	0.333	1.548	0.646	6
964	21	Dk 6	1	0.500	1.752	0.571	7
965	22	Kc	1	0.333	1.718	0.582	7
966	23	Bd 3	1	0.333	1.718	0.582	7
967	24	Rf 4	2	1.500	1.820	0.549	7
968	25	Dk 7	1	0.500	2.229	0.449	8
969	26	Os	1	0.500	1.786	0.560	0
970	H 21	DRM2	–	–	–	–	–
971	1	Zr 1	2	1.333	1.273	0.786	1
972	2	Kg	3	1.750	0.727	1.375	2
973	3	Bd	1	0.333	1.455	0.688	3
974	4	Tg	4	2.667	0.545	1.833	3
975	5	Kc	1	0.250	1.273	0.786	4
976	6	Rf	3	2.250	0.909	1.100	4
977	7	Dk 1	1	0.250	1.273	0.786	4
978	8	Dk 2	1	0.333	1.636	0.611	5
979	9	Dk 3	1	0.333	1.636	0.611	5
980	10	Os	1	0.500	2.000	0.500	0
981	H109	DRM3	–	–	–	–	–
982	1	Zr 1	2	1.500	1.809	0.553	1
983	2	Zr 2	2	1.000	1.281	0.781	2
984	3	Kg	2	0.750	0.904	1.106	3
985	4	Tg 1	4	2.750	0.678	1.475	4
986	5	Dk 1	1	0.250	1.356	0.737	5
987	6	Tg 2	4	3.250	0.904	1.106	5
988	7	Kc	1	0.250	1.356	0.737	5
989	8	Dk 2	1	0.250	1.582	0.632	6
990	9	Bd	1	0.250	1.582	0.632	6
991	10	Dk 3	1	0.250	1.582	0.632	6
992	11	Os	1	0.500	2.487	0.402	0
993	H 2	DRM4	–	–	–	–	–
994	1	Zr 1	3	2.500	1.443	0.693	1
995	2	So 1	2	0.583	1.075	0.930	2
996	3	Dk 1	1	0.333	1.924	0.520	2
997	4	Sr	4	2.500	0.764	1.309	3
998	5	Dk 2	1	0.250	1.245	0.803	4
999	6	So 2	2	0.417	0.849	1.178	4
1000	7	Bn	2	0.583	1.019	0.982	4
1001	8	Tg	6	5.000	0.990	1.010	5
1002	9	Fl	3	2.000	1.330	0.752	5
1003	10	Rf	2	1.167	1.415	0.707	6
1004	11	Dk 3	1	0.167	1.471	0.680	6
1005	12	Dk 4	1	0.167	1.471	0.680	6
1006	13	Dk 5	1	0.167	1.471	0.680	6
1007	14	Bd 1	1	0.167	1.471	0.680	6
1008	15	Dk 6	1	0.333	1.811	0.552	6
1009	16	Dk 7	2	1.333	1.754	0.570	6
1010	17	Dk 8	1	0.500	1.896	0.527	7
1011	18	Bd 2	1	0.500	2.235	0.447	7
1012	19	Os	1	0.333	1.924	0.520	0

APPENDIX 17(13): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1013	H22 DRM5		—	—	—	—	—
1014	1	Zr 1	2	1.500	1.727	0.579	1
1015	2	Zr 2	2	1.000	1.182	0.846	2
1016	3	Zr 3	2	0.700	0.818	1.222	3
1017	4	Tg	5	4.000	0.636	1.571	4
1018	5	Bd 1	1	0.200	1.364	0.733	5
1019	6	Bd 2	1	0.200	1.364	0.733	5
1020	7	Fl	2	1.200	1.182	0.846	5
1021	8	Dk 1	1	0.200	1.364	0.733	5
1022	9	Dk 2	1	0.500	1.909	0.524	6
1023	10	Os	1	0.500	2.454	0.407	0
1024	H134 DAR1		—	—	—	—	—
1025	1	Zr 1	2	1.000	1.371	0.729	1
1026	2	Sg	2	1.000	1.371	0.729	1
1027	3	Zr 2	2	0.750	1.024	0.977	2
1028	4	Dk 1	2	0.750	1.024	0.977	2
1029	5	Ts	4	1.700	0.676	1.479	3
1030	6	Tg	5	3.583	0.831	1.204	4
1031	7	Bn	2	0.417	0.753	1.328	4
1032	8	Dk 2	1	0.200	1.255	0.797	5
1033	9	Ms	1	0.200	1.255	0.797	5
1034	10	Rf 1	3	1.700	1.140	0.878	5
1035	11	Kc 1	1	0.200	1.255	0.797	5
1036	12	Kw	6	4.333	0.869	1.151	5
1037	13	Dk 3	1	0.333	1.565	0.639	6
1038	14	Rf 2	2	1.333	1.526	0.655	6
1039	15	Kc 2	1	0.167	1.294	0.773	6
1040	16	Bd	1	0.167	1.294	0.773	6
1041	17	Dk 4	1	0.167	1.294	0.773	6
1042	18	Rf 2	3	2.167	1.217	0.822	6
1043	19	Vr	2	1.167	1.255	0.797	6
1044	20	Dk 5	1	0.500	1.951	0.513	7
1045	21	Dk 6	1	0.333	1.642	0.609	7
1046	22	Dk 7	1	0.333	1.642	0.609	7
1047	23	Kw	1	0.500	1.680	0.595	7
1048	24	Os	2	1.000	1.719	0.582	0
1049	H110 DAR2		—	—	—	—	—
1050	1	Zr 1	3	2.500	1.130	0.885	1
1051	2	Zr 2	2	0.533	0.754	1.327	2
1052	3	Sg	1	0.333	1.809	0.553	2
1053	4	Tg 1	5	3.833	0.527	1.896	3
1054	5	Dk 1	1	0.200	1.206	0.829	3
1055	6	Bd	1	0.200	1.206	0.829	3
1056	7	Dk 2	1	0.200	1.206	0.829	3
1057	8	Tg 2	3	2.200	0.904	1.106	5
1058	9	Dk 3	1	0.333	1.582	0.632	4
1059	10	Rj	1	0.333	1.582	0.632	4
1060	11	Os	1	0.333	1.809	0.553	0
1061	H 76 DAR3		—	—	—	—	—
1062	1	Zr 1	2	1.000	1.897	0.527	1
1063	2	Zr 2	2	1.000	1.533	0.652	2
1064	3	Zr 3	2	0.833	1.221	0.819	3
1065	4	Tg 1	3	1.750	0.961	1.040	4
1066	5	Ts	4	2.083	0.805	1.242	5
1067	6	Bd	1	0.333	1.429	0.700	5
1068	7	Tg 2	4	2.583	1.013	0.987	6
1069	8	Dk 1	1	0.250	1.273	0.786	6
1070	9	Bn	2	0.583	1.065	0.939	6
1071	10	St	1	0.250	1.481	0.675	7
1072	11	Kc	1	0.250	1.481	0.675	7
1073	12	Fl	3	2.250	1.377	0.726	7
1074	13	Rf 1	3	2.000	1.377	0.726	7
1075	14	Dk 2	1	0.333	1.845	0.542	8
1076	15	Dk 3	1	0.333	1.845	0.542	8
1077	16	Rf 2	2	1.333	1.793	0.558	8
1078	17	Dk 4	1	0.333	1.845	0.542	8
1079	18	Dk 5	1	0.500	2.260	0.442	9
1080	19	Sg	1	0.500	2.780	0.360	1
1081	20	Os	2	1.500	2.312	0.432	0
1082	H 87 DAR4		—	—	—	—	—
1083	1	Dk 1	2	1.500	1.760	0.568	1
1084	2	Zr 1	2	0.750	1.265	0.791	2
1085	3	Zr 2	4	2.333	0.880	1.137	3
1086	4	Dk 2	1	0.250	1.485	0.674	4
1087	5	Kg	3	1.000	0.770	1.299	4
1088	6	Dk 3	2	0.583	1.100	0.909	4
1089	7	Rf	4	2.667	0.825	1.212	5
1090	8	Dk 4	1	0.250	1.430	0.699	6
1091	9	Tg	3	2.250	1.210	0.827	6
1092	10	Dk 5	1	0.250	1.430	0.699	6
1093	11	Dk 6	1	0.333	1.815	0.551	7
1094	12	Bd	1	0.333	1.815	0.551	7
1095	13	Os	1	0.500	2.365	0.423	0

APPENDIX 17(14): RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1096	H97 DAR5		—	—	—	—	—
1097	1	Zr 1	3	1.333	1.179	0.848	1
1098	2	Zr 2	3	1.333	1.510	0.662	1
1099	3	Zr 3	2	0.583	0.910	1.099	2
1100	4	Zr 4	2	1.333	1.903	0.526	2
1101	5	Tg 1	4	2.033	0.682	1.465	3
1102	6	Dk 1	1	0.500	2.337	0.428	3
1103	7	Rf 1	3	2.250	1.034	0.967	4
1104	8	Kc	1	0.250	1.117	0.895	4
1105	9	Tg 2	5	2.450	0.662	1.511	4
1106	10	Dk 2	1	0.333	1.468	0.681	5
1107	11	Dk 3	1	0.333	1.468	0.681	5
1108	12	Bn	2	0.700	1.013	0.987	5
1109	13	Rf 2	2	1.200	1.055	0.948	5
1110	14	Rf 3	5	4.200	0.931	1.075	5
1111	15	Bd	1	0.200	1.096	0.912	5
1112	16	Rf 4	2	1.500	1.406	0.711	6
1113	17	Dk 4	1	0.500	1.489	0.672	6
1114	18	Dk 5	1	0.200	1.365	0.733	6
1115	19	Dk 6	1	0.200	1.365	0.733	6
1116	20	Dk 7	1	0.200	1.365	0.733	6
1117	21	Dk 8	1	0.200	1.365	0.733	6
1118	22	Dk 9	1	0.500	1.841	0.543	7
1119	23	Os	2	0.667	1.551	0.645	0
1120	H98 GBR-1		—	—	—	—	—
1121	1	Gr	2	0.583	1.391	0.719	1
1122	2	Zr 1	4	1.533	0.985	1.015	1
1123	3	Fl 1	5	2.726	0.676	1.479	1
1124	4	Zr 2	2	0.750	1.062	0.941	2
1125	5	Tg	7	3.867	0.464	2.157	2
1126	6	Dk 1	1	0.200	1.101	0.908	2
1127	7	Bd 1	1	0.200	1.101	0.908	2
1128	8	Zr 3	2	0.643	0.811	1.233	3
1129	9	Kc	1	0.143	0.889	1.125	3
1130	10	Fl 2	3	2.143	0.811	1.233	3
1131	11	Fl 3	3	2.143	0.811	1.233	3
1132	12	St	1	0.143	0.889	1.125	3
1133	13	Bn	2	0.393	0.657	1.523	3
1134	14	Dk 2	1	0.333	1.236	0.809	4
1135	15	Wc 1	1	0.333	1.236	0.809	4
1136	16	Dk 3	1	0.333	1.236	0.809	4
1137	17	Wc 2	1	0.333	1.236	0.809	4
1138	18	Fl 4	4	2.833	0.889	1.125	4
1139	19	Ts	3	2.250	1.236	0.809	5
1140	20	Kw	1	0.250	1.313	0.761	5
1141	21	Dk 4	1	0.250	1.313	0.761	5
1142	22	Bd 2	1	0.333	1.661	0.602	6
1143	23	Dk 5	1	0.333	1.661	0.602	6
1144	24	Os	3	0.950	1.024	0.977	0
1145	H30 GBR-2		—	—	—	—	—
1146	1	Zr 1	2	1.500	2.035	0.492	1
1147	2	Zr 2	2	1.000	1.507	0.664	2
1148	3	Zr 3	2	1.000	1.130	0.885	3
1149	4	Ts	2	0.700	0.904	1.106	4
1150	5	Tg	5	4.000	0.829	1.206	5
1151	6	Bd	1	0.200	1.507	0.664	6
1152	7	Kc	1	0.200	1.507	0.664	6
1153	8	Rf	2	1.200	1.356	0.737	6
1154	9	Dk 1	1	0.200	1.507	0.664	6
1155	10	Dk 2	1	0.500	2.035	0.492	7
1156	11	Os	1	0.500	2.713	0.369	0
1157	H 31 GBR-3		—	—	—	—	—
1158	1	Zr 1	3	2.500	1.658	0.603	1
1159	2	Dk 1	1	0.333	2.336	0.428	2
1160	3	Zr 2	2	0.833	1.281	0.781	2
1161	4	Zr 3	2	1.000	1.055	0.948	3
1162	5	Zr 4	2	0.700	0.980	1.021	4
1163	6	Tg	5	4.500	1.055	0.948	5
1164	7	Dk 2	1	0.200	1.733	0.577	6
1165	8	Dk 3	1	0.200	1.733	0.577	6
1166	9	Bd	1	0.200	1.733	0.577	6
1167	10	Dk 4	1	0.200	1.733	0.577	6
1168	11	Os	1	0.333	2.336	0.428	0
1169	H56 GBR-4		—	—	—	—	—
1170	1	Zr 1	3	2.500	1.487	0.673	1
1171	2	Sg	1	0.333	2.039	0.490	2
1172	3	Zr 2	2	0.833	1.105	0.905	2
1173	4	Kc	2	0.700	0.807	1.239	3
1174	5	Tg	5	3.083	0.595	1.681	4
1175	6	Ts	3	2.200	0.977	1.023	5
1176	7	Dk 1	1	0.200	1.147	0.872	5
1177	8	Dk 2	1	0.200	1.147	0.872	5
1178	9	Rf	4	3.200	0.892	1.121	5
1179	10	Bd	1	0.333	1.529	0.654	6
1180	11	Wk	1	0.333	1.529	0.654	6
1181	12	Dk 3	1	0.250	1.444	0.692	6
1182	13	Dk 4	1	0.250	1.444	0.692	6
1183	14	Dk 5	1	0.250	1.444	0.692	6
1184	15	Os	1	0.333	2.039	0.490	0

APPENDIX17(15):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
1185	H 37 GBR-5		–	–	–	–	–
1186	1	Zr 1	2	1.500	1.276	0.783	1
1187	2	Kc	2	0.667	0.766	1.306	2
1188	3	Tg 1	6	4.333	0.383	2.612	3
1189	4	Rf	2	1.167	0.893	1.119	4
1190	5	Dk 1	1	0.167	1.021	0.979	4
1191	6	Tg 2	3	2.167	0.766	1.306	4
1192	7	Bd	1	0.167	1.021	0.979	4
1193	8	Dk 2	1	0.167	1.021	0.979	4
1194	9	Dk 3	1	0.500	1.532	0.653	5
1195	10	Dk 4	1	0.333	1.404	0.712	5
1196	11	Dk 5	1	0.333	1.404	0.712	5
1197	12	Os	1	0.500	1.915	0.522	0
1198	H101 KOK1		–	–	–	–	–
1199	1	Gr	2	0.667	1.122	0.891	1
1200	2	Zr 1	2	0.667	1.122	0.891	1
1201	3	Zr 2	3	1.167	1.026	0.975	1
1202	4	Ts	3	1.167	0.994	1.006	2
1203	5	Dk 1	3	2.333	1.363	0.734	2
1204	6	Bn 1	2	0.533	0.962	1.040	2
1205	7	Tg	6	4.167	0.834	1.199	3
1206	8	Bd 1	1	0.333	1.764	0.567	3
1207	9	St 1	1	0.333	1.764	0.567	3
1208	10	Kw 1	5	3.250	0.802	1.247	3
1209	11	Rf 1	3	2.167	1.170	0.854	4
1210	12	Bd 2	1	0.167	1.235	0.810	4
1211	13	Kc	1	0.167	1.235	0.810	4
1212	14	St 2	1	0.167	1.235	0.810	4
1213	15	Bn 2	2	0.417	0.818	1.223	4
1214	16	Kw 2	4	2.033	0.754	1.327	4
1215	17	Bd 3	1	0.200	1.202	0.832	4
1216	18	Dk 2	1	0.200	1.202	0.832	4
1217	19	Dk 3	2	1.200	1.170	0.854	4
1218	20	Dk 4	1	0.333	1.571	0.636	5
1219	21	Dk 5	1	0.333	1.571	0.636	5
1220	22	Rf 2	3	2.250	1.090	0.917	5
1221	23	Vr	1	0.250	1.154	0.866	5
1222	24	St 3	1	0.500	1.571	0.636	5
1223	25	Dk 6	1	0.333	1.491	0.671	6
1224	26	Dk 7	1	0.333	1.491	0.671	6
1225	27	Os	3	1.333	1.090	0.917	0
1226	H102 KOK2		–	–	–	–	–
1227	1	Sg	2	0.583	1.860	0.538	1
1228	2	Zr 1	3	1.083	1.283	0.780	1
1229	3	Sr 1	4	2.333	1.523	0.657	2
1230	4	Zr 2	2	0.667	1.138	0.878	2
1231	5	Ms	1	0.250	1.924	0.520	3
1232	6	Bn 1	2	0.750	1.860	0.538	3
1233	7	Sr 2	3	1.333	1.026	0.975	3
1234	8	Rf 1	2	1.500	2.229	0.449	4
1235	9	Fr	2	0.533	1.042	0.960	4
1236	10	Bn 2	3	2.333	1.363	0.734	4
1237	11	Dk 2	1	0.500	2.629	0.380	5
1238	12	Tg	5	3.700	1.090	0.917	5
1239	13	Dk 3	1	0.333	1.764	0.567	5
1240	14	Dk 4	1	0.333	1.764	0.567	5
1241	15	Bd	1	0.200	1.491	0.671	6
1242	16	Bh	1	0.200	1.491	0.671	6
1243	17	Kc	1	0.200	1.491	0.671	6
1244	18	Rf 2	5	3.700	1.267	0.790	6
1245	19	Dk 5	1	0.200	1.667	0.600	7
1246	20	Dk 6	1	0.200	1.667	0.600	7
1247	21	Dk 7	1	0.200	1.667	0.600	7
1248	22	Bn 3	2	0.700	1.571	0.636	7
1249	23	Rf 3	2	1.000	1.908	0.524	8
1250	24	Dk 8	2	1.500	2.277	0.439	9
1251	25	Dk 9	1	0.500	2.677	0.373	10
1252	26	Dk 1	1	0.333	2.020	0.495	1
1253	27	Os	3	1.833	1.619	0.618	0
1254	H45 KOK-3		–	–	–	–	–
1255	1	Zr 1	2	1.000	1.210	0.827	1
1256	2	Zr 2	2	0.667	0.825	1.212	2
1257	3	Tg	6	4.833	0.550	1.819	3
1258	4	Bd	1	0.167	1.155	0.866	4
1259	5	Kc	1	0.167	1.155	0.866	4
1260	6	Bn	3	1.667	0.825	1.212	4
1261	7	Dk 1	1	0.167	1.155	0.866	4
1262	8	Dk 2	1	0.167	1.155	0.866	4
1263	9	Rf	2	1.333	1.320	0.758	5
1264	10	Dk 3	1	0.333	1.430	0.699	5
1265	11	Dk 4	1	0.500	1.925	0.520	6
1266	12	Sg	1	0.500	2.310	0.433	1
1267	13	Os	2	1.500	1.705	0.587	0
1268	H32 KOK-4		–	–	–	–	–
1269	1	Zr 1	2	1.500	2.110	0.474	1
1270	2	Zr 2	2	1.000	1.582	0.632	2
1271	3	Kg	2	1.000	1.206	0.829	3
1272	4	Zr 3	2	0.750	0.980	1.021	4
1273	5	Tg	4	2.833	0.904	1.106	5
1274	6	Kc	1	0.250	1.582	0.632	6
1275	7	Bd	1	0.250	1.582	0.632	6
1276	8	Rf	3	2.250	1.281	0.781	6
1277	9	Dk 1	1	0.333	1.959	0.510	7
1278	10	Dk 2	1	0.333	1.959	0.510	7
1279	11	Os	1	0.500	2.788	0.359	0

APPENDIX17(16):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1280	H158 KOK5		—	—	—	—	—
1281	1	Zr 1	3	1.333	1.262	0.792	1
1282	2	So	2	0.533	1.000	1.000	2
1283	3	Kg	2	0.533	1.000	1.000	2
1284	4	Ts 1	5	2.433	0.738	1.355	3
1285	5	Sr 1	3	2.200	1.032	0.969	4
1286	6	Dk 1	1	0.200	1.064	0.940	4
1287	7	Tg 1	10	8.400	0.571	1.750	4
1288	8	Bd 1	1	0.333	1.357	0.737	5
1289	9	Wk	1	0.333	1.357	0.737	5
1290	10	Dk 2	1	0.100	0.897	1.115	5
1291	11	Dk 3	1	0.100	0.897	1.115	5
1292	12	Dk 4	1	0.100	0.897	1.115	5
1293	13	Dk 5	1	0.100	0.897	1.115	5
1294	14	Dk 6	1	0.100	0.897	1.115	5
1295	15	Dk 7	1	0.100	0.897	1.115	5
1296	16	Dk 8	1	0.100	0.897	1.115	5
1297	17	Dk 9	1	0.100	0.897	1.115	5
1298	18	Tg 2	5	1.933	0.548	1.826	5
1299	19	Tg 3	6	5.200	0.794	1.260	6
1300	20	Rf 1	2	1.200	0.857	1.167	6
1301	21	Dk 10	1	0.200	0.873	1.145	6
1302	22	Ts 2	6	4.033	0.683	1.465	6
1303	23	Dk 11	1	0.167	1.119	0.894	7
1304	24	Dk 12	1	0.167	1.119	0.894	7
1305	25	Dk 13	1	0.167	1.119	0.894	7
1306	26	Dk 14	1	0.167	1.119	0.894	7
1307	27	Bd 2	1	0.167	1.119	0.894	7
1308	28	Dk 15	1	0.500	1.183	0.846	7
1309	29	Dk 16	1	0.167	1.008	0.992	7
1310	30	Dk 17	1	0.167	1.008	0.992	7
1311	31	Dk 18	1	0.167	1.008	0.992	7
1312	32	Rf 2	2	1.167	0.992	1.008	7
1313	33	Ts 3	3	0.917	0.913	1.096	7
1314	34	Dk 19	1	0.500	1.317	0.759	8
1315	35	Tg 4	4	3.333	1.190	0.840	8
1316	36	Sr 2	2	1.333	1.222	0.818	8
1317	37	Dk 20	1	0.250	1.516	0.660	9
1318	38	Dk 21	1	0.250	1.516	0.660	9
1319	39	Dk 22	1	0.250	1.516	0.660	9
1320	40	Dk 23	1	0.500	1.548	0.646	9
1321	41	Sg 1	1	0.333	1.881	0.532	9
1322	42	Sg 2	1	0.333	1.881	0.532	1
1323	43	Os	3	2.333	1.556	0.643	1
1324	152 KMG1		—	—	—	—	—
1325	1	Zr	2	1.000	1.297	0.771	1
1326	2	Kg	2	0.700	1.011	0.989	2
1327	3	Ts 1	5	2.583	0.739	1.353	3
1328	4	Sr 1	4	1.600	0.802	1.247	4
1329	5	Rf 1	2	1.200	1.039	0.962	4
1330	6	Dk 1	1	0.200	1.053	0.950	4
1331	7	Sr 2	3	0.650	0.788	1.269	4
1332	8	Tg 1	5	3.750	1.046	0.956	5
1333	9	Dk 2	1	0.250	1.116	0.896	5
1334	10	Tg 2	5	3.250	0.976	1.024	5
1335	11	Dk 3	1	0.500	1.353	0.739	5
1336	12	Sr 3	4	2.533	0.934	1.070	5
1337	13	Tg 3	5	3.833	1.032	0.969	5
1338	14	Bd 1	1	0.200	1.360	0.735	6
1339	15	Dk 4	1	0.200	1.360	0.735	6
1340	16	Rf 2	2	1.200	1.346	0.743	6
1341	17	Dk 5	1	0.200	1.360	0.735	6
1342	18	Ts 2	2	0.533	1.220	0.819	6
1343	19	Dk 6	1	0.200	1.290	0.775	6
1344	20	Rf 3	2	1.200	1.276	0.784	6
1345	21	Dk 7	1	0.200	1.290	0.775	6
1346	22	Rd	1	0.250	1.248	0.801	6
1347	23	Rf 4	1	0.250	1.248	0.801	6
1348	24	Tg 4	5	3.500	1.123	0.891	6
1349	25	Kc 1	1	0.200	1.346	0.743	6
1350	26	Dk 8	1	0.200	1.346	0.743	6
1351	27	Rf 5	2	1.200	1.332	0.751	6
1352	28	Dk 9	1	0.200	1.346	0.743	6
1353	29	Dk 10	1	0.500	1.660	0.603	7
1354	30	Tg 5	3	1.833	1.478	0.676	7
1355	31	Dk 11	1	0.500	1.590	0.629	7
1356	32	Dk 12	1	0.200	1.437	0.696	7
1357	33	Kc 2	1	0.200	1.437	0.696	7
1358	34	Ts 3	4	2.200	1.367	0.732	7
1359	35	Tg 6	1	0.200	1.437	0.696	7
1360	36	Dk 13	1	0.500	1.646	0.608	7
1361	37	Bd 2	1	0.333	1.792	0.558	8
1362	38	Rf 6	3	2.333	1.764	0.567	8
1363	39	Rf 7	2	1.250	1.667	0.600	8
1364	40	Dk 14	1	0.250	1.681	0.595	8
1365	41	Rf 8	2	1.250	1.667	0.600	8
1366	42	Dk 15	1	0.333	2.078	0.481	9
1367	43	Dk 16	1	0.333	2.078	0.481	9
1368	44	Dk 17	1	0.500	1.980	0.505	9
1369	45	Dk 18	1	0.500	1.980	0.505	9
1370	46	Sg	1	0.500	1.911	0.523	1
1371	47	Os	2	1.500	1.597	0.626	0

APPENDIX17(17):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1372	H159 KMG2		—	—	—	—	—
1373	1	Zr 1	3	0.893	0.948	1.055	1
1374	2	Zr 2	2	0.643	1.439	0.695	1
1375	3	Kg 1	4	1.310	0.741	1.350	2
1376	4	Tg 1	7	5.833	1.172	0.854	2
1377	5	Zr 3	2	0.500	0.930	1.075	3
1378	6	Sr 1	7	4.167	0.724	1.382	3
1379	7	Tg 2	3	1.450	0.939	1.065	3
1380	8	Dk 1	1	0.143	1.447	0.691	3
1381	9	Dk 2	1	0.143	1.447	0.691	3
1382	10	Ms	1	0.143	1.447	0.691	3
1383	11	Dk 3	1	0.143	1.447	0.691	3
1384	12	Dk 4	1	0.143	1.447	0.691	3
1385	13	Tg 3	4	2.250	1.128	0.886	4
1386	14	Sr 2	4	1.476	0.844	1.185	4
1387	15	Kg 2	3	1.393	0.948	1.055	4
1388	16	So 1	3	1.643	0.965	1.036	4
1389	17	Dk 5	1	0.143	0.999	1.001	4
1390	18	Dk 6	1	0.143	0.999	1.001	4
1391	19	Dk 7	1	0.143	0.999	1.001	4
1392	20	Bd 1	1	0.333	1.215	0.823	4
1393	21	Tg 4	5	3.167	1.154	0.866	4
1394	22	Rf 1	4	3.250	1.378	0.726	5
1395	23	Rf 2	2	0.583	1.378	0.726	5
1396	24	Bd 2	1	0.250	1.404	0.712	5
1397	25	Rf 3	2	1.250	1.111	0.900	5
1398	26	So 2	2	0.750	1.094	0.914	5
1399	27	So 3	3	1.750	1.025	0.976	5
1400	28	Bd 3	1	0.333	1.223	0.818	5
1401	29	Rf 4	4	2.833	1.189	0.841	5
1402	30	Dk 8	1	0.333	1.240	0.806	5
1403	31	Bn	2	0.833	1.223	0.818	5
1404	32	Dk 9	1	0.200	1.430	0.699	5
1405	33	Dk 10	1	0.200	1.430	0.699	5
1406	34	Rf 5	3	2.200	1.413	0.708	5
1407	35	Rf 6	2	1.200	1.421	0.704	5
1408	36	Dk 11	1	0.250	1.654	0.605	6
1409	37	Dk 12	1	0.250	1.654	0.605	6
1410	38	Dk 13	1	0.250	1.654	0.605	6
1411	39	Rf 7	3	2.500	1.637	0.611	6
1412	40	Dk 14	1	0.500	1.387	0.721	6
1413	41	So 4	2	1.000	1.352	0.739	6
1414	42	Dk 15	1	0.333	1.301	0.769	6
1415	43	Tg 5	2	0.583	1.223	0.818	6
1416	44	Dk 16	1	0.250	1.464	0.683	6
1417	45	Dk 17	1	0.250	1.464	0.683	6
1418	46	Tg 6	2	1.250	1.456	0.687	6
1419	47	Rf 8	2	1.500	1.490	0.671	6
1420	48	Dk 18	1	0.333	1.688	0.592	6
1421	49	Dk 19	1	0.333	1.688	0.592	6
1422	50	Dk 20	1	0.500	1.697	0.589	6
1423	51	Dk 21	1	0.333	1.912	0.523	7
1424	52	Dk 22	1	0.333	1.912	0.523	7
1425	53	Rf 9	2	1.500	1.619	0.617	7
1426	54	Rf 10	4	2.750	1.430	0.699	7
1427	55	Dk 23	1	0.500	1.731	0.578	7
1428	56	Dk 24	1	0.500	1.766	0.566	7
1429	57	Dk 25	1	0.500	1.895	0.528	8
1430	58	Dk 26	1	0.250	1.706	0.586	8
1431	59	Tg 7	4	2.250	1.663	0.601	8
1432	60	Dk 27	1	0.250	1.706	0.586	8
1433	61	Rf 11	2	1.250	1.930	0.518	9
1434	62	Rf 12	2	1.250	1.930	0.518	9
1435	63	Bd 4	1	0.250	1.938	0.516	9
1436	64	Dk 28	1	0.500	2.205	0.453	10
1437	65	Dk 29	1	0.500	2.205	0.453	10
1438	66	Os	2	0.833	1.215	0.823	0
1439	H38 KMG3		—	—	—	—	—
1440	1	Zr 1	2	1.500	1.659	0.603	1
1441	2	Zr 2	2	1.000	1.149	0.871	2
1442	3	Kg	2	0.667	0.766	1.306	3
1443	4	Tg	6	4.833	0.511	1.959	4
1444	5	Bd	1	0.167	1.149	0.871	5
1445	6	Dk 1	1	0.167	1.149	0.871	5
1446	7	Kc	1	0.167	1.149	0.871	5
1447	8	Dk 2	1	0.167	1.149	0.871	5
1448	9	Rf	3	2.167	0.893	1.119	5
1449	10	Dk 3	1	0.333	1.532	0.653	6
1450	11	Dk 4	1	0.333	1.532	0.653	6
1451	12	Os	1	0.500	2.297	0.435	0
1452	H 8 KMG4		—	—	—	—	—
1453	1	Zr	2	1.500	1.885	0.530	1
1454	2	So	2	1.000	1.305	0.766	2
1455	3	Kg	2	0.833	1.015	0.985	3
1456	4	Tg	3	2.000	1.015	0.985	4
1457	5	Rf	2	1.333	1.595	0.627	5
1458	6	Bd	1	0.333	1.885	0.530	5
1459	7	Dk	1	0.500	2.465	0.406	5
1460	8	Os	1	0.500	2.755	0.363	0

APPENDIX17(18):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
1461	H117	KMG5	—	—	—	—	—
1462	1	Zr 1	3	2.500	1.105	0.905	1
1463	2	Zr 2	2	0.500	0.721	1.387	2
1464	3	Sg	1	0.333	1.682	0.595	2
1465	4	Tg	6	3.833	0.432	2.312	3
1466	5	Rf 1	2	1.167	0.913	1.095	4
1467	6	Rf 2	3	2.167	0.817	1.224	4
1468	7	Kc	1	0.167	1.009	0.991	4
1469	8	Bd	1	0.167	1.009	0.991	4
1470	9	Rf 3	2	1.167	0.913	1.095	4
1471	10	Dk 1	1	0.500	1.490	0.671	5
1472	11	Dk 2	1	0.333	1.393	0.718	5
1473	12	Dk 3	1	0.333	1.393	0.718	5
1474	13	Dk 4	1	0.500	1.490	0.671	5
1475	14	Os	1	0.333	1.682	0.595	0
1476	H46	MGN1	—	—	—	—	—
1477	1	Zr 1	2	1.500	1.595	0.627	1
1478	2	Zr 2	2	0.833	1.100	0.909	2
1479	3	So	3	1.250	0.715	1.399	3
1480	4	Ts	4	2.167	0.660	1.515	4
1481	5	Bn	2	1.333	1.210	0.827	4
1482	6	Rf	3	2.250	1.045	0.957	5
1483	7	Tg	2	1.250	1.155	0.866	5
1484	8	Bd	1	0.250	1.265	0.791	5
1485	9	Dk 1	1	0.500	1.815	0.551	5
1486	10	Dk 2	1	0.333	1.650	0.606	6
1487	11	Dk 3	1	0.333	1.650	0.606	6
1488	12	Kc	1	0.500	1.760	0.568	6
1489	13	Os	1	0.500	2.200	0.455	0
1490	H88	MGN2	—	—	—	—	—
1491	1	Zr	2	1.000	1.375	0.727	1
1492	2	Sg	2	0.750	0.935	1.070	1
1493	3	Ts	2	0.700	0.990	1.010	2
1494	4	Rf 1	4	2.200	0.550	1.819	2
1495	5	Tg	5	3.750	0.605	1.653	3
1496	6	Dk 1	1	0.250	1.155	0.866	3
1497	7	Bn	2	0.750	0.935	1.070	3
1498	8	Kc	1	0.200	1.210	0.827	4
1499	9	Bd	1	0.200	1.210	0.827	4
1500	10	Ms	1	0.200	1.210	0.827	4
1501	11	Rf 2	2	1.500	1.430	0.699	4
1502	12	Dk 2	1	0.500	2.035	0.492	5
1503	13	Os	2	1.000	1.320	0.758	0
1504	H16	MGN3	—	—	—	—	—
1505	1	Zr	2	1.250	1.127	0.887	1
1506	2	Ts	4	2.833	0.564	1.774	2
1507	3	Kc	1	0.250	1.353	0.739	3
1508	4	Tg	3	1.750	0.676	1.478	3
1509	5	Bd	1	0.250	1.353	0.739	3
1510	6	Rf	2	1.333	1.240	0.806	4
1511	7	Dk 1	1	0.333	1.466	0.682	4
1512	8	Dk 2	1	0.500	2.029	0.493	5
1513	9	Os	1	0.500	1.916	0.522	0
1514	H91	MGN4	—	—	—	—	—
1515	1	Fl 1	4	2.833	1.127	0.887	1
1516	2	Zr 1	2	0.833	1.264	0.791	2
1517	3	Zr 2	3	0.950	0.820	1.220	2
1518	4	Dk 1	1	0.250	1.640	0.610	3
1519	5	Bd 1	1	0.250	1.640	0.610	3
1520	6	Tg	5	3.167	0.649	1.541	4
1521	7	Kc	1	0.200	1.162	0.861	5
1522	8	Bn	2	0.700	0.888	1.126	5
1523	9	Fl 2	3	2.200	1.025	0.976	5
1524	10	Bd 2	1	0.200	1.162	0.861	5
1525	11	Kw 1	2	0.833	1.196	0.836	6
1526	12	Dk 2	1	0.333	1.537	0.650	6
1527	13	Dk 3	1	0.333	1.537	0.650	6
1528	14	Fl 3	3	2.500	1.572	0.636	7
1529	15	Dk 4	1	0.333	2.084	0.480	8
1530	16	Kw 2	1	0.333	2.084	0.480	8
1531	17	Os	2	0.750	1.572	0.636	0
1532	H59	MGN5	—	—	—	—	—
1533	1	Zr 1	2	1.000	1.657	0.604	1
1534	2	Ts	2	1.000	1.275	0.785	2
1535	3	Zr 2	2	0.700	0.977	1.023	3
1536	4	Tg 1	5	3.333	0.765	1.308	4
1537	5	Kc	1	0.200	1.317	0.759	5
1538	6	Rf 1	3	1.700	0.977	1.023	5
1539	7	Bn	2	1.200	1.232	0.812	5
1540	8	Bd 1	1	0.200	1.317	0.759	5
1541	9	Dk 1	1	0.333	1.529	0.654	6
1542	10	Tg 2	2	0.833	1.359	0.736	6
1543	11	Dk 2	1	0.500	1.784	0.560	6
1544	12	Rf 2	2	1.500	1.827	0.547	7
1545	13	Dk 3	1	0.500	2.379	0.420	8
1546	14	Sg	1	0.500	2.676	0.374	1
1547	15	Os	2	1.500	2.124	0.471	0

APPENDIX17(19):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
1548	H33 SRF-1		—	—	—	—	—
1549	1	Zr 1	2	1.500	1.582	0.632	1
1550	2	Zr 2	2	0.833	1.055	0.948	2
1551	3	Sr	3	1.250	0.678	1.475	3
1552	4	Bn	2	1.333	1.206	0.829	4
1553	5	Tg	4	2.833	0.754	1.327	4
1554	6	Dk 1	1	0.500	1.884	0.531	5
1555	7	Rf	2	1.250	1.281	0.781	5
1556	8	Bd	1	0.250	1.432	0.698	5
1557	9	Dk 2	1	0.250	1.432	0.698	5
1558	10	Dk 3	1	0.500	1.959	0.510	6
1559	11	Os	1	0.500	2.261	0.442	0
1560	H121 SRF-2		—	—	—	—	—
1561	1	Zr 1	2	1.333	1.232	0.812	1
1562	2	Zr 2	3	1.033	0.765	1.308	2
1563	3	Kg	3	1.833	0.807	1.239	3
1564	4	Tg 1	5	4.333	0.977	1.023	3
1565	5	Dk 1	1	0.333	1.359	0.736	4
1566	6	Zr 3	2	0.583	1.020	0.981	4
1567	7	Kc	1	0.200	1.529	0.654	4
1568	8	Bd 1	1	0.200	1.529	0.654	4
1569	9	Dk 2	1	0.200	1.529	0.654	4
1570	10	Dk 3	1	0.200	1.529	0.654	4
1571	11	Tg 2	4	3.500	1.317	0.759	5
1572	12	Dk 4	1	0.250	1.869	0.535	6
1573	13	Dk 5	1	0.250	1.869	0.535	6
1574	14	Bd 2	1	0.250	1.869	0.535	6
1575	15	Os	1	0.500	1.784	0.560	0
1576	H122 SRF-3		—	—	—	—	—
1577	1	Zr 1	3	2.000	1.062	0.941	1
1578	2	Zr 2	2	0.833	1.138	0.879	2
1579	3	Zr 3	2	0.583	1.138	0.879	2
1580	4	Zr 4	2	0.700	1.290	0.775	3
1581	5	Tg 1	4	2.833	1.290	0.775	3
1582	6	Tg 2	5	4.500	1.517	0.659	4
1583	7	Bd 1	1	0.250	1.821	0.549	4
1584	8	Dk 1	1	0.250	1.821	0.549	4
1585	9	Fl	3	2.250	1.669	0.599	4
1586	10	Dk 2	1	0.200	2.049	0.488	5
1587	11	Kc	1	0.200	2.049	0.488	5
1588	12	Bd 2	1	0.200	2.049	0.488	5
1589	13	Dk 3	1	0.200	2.049	0.488	5
1590	14	Dk 4	1	0.333	2.200	0.454	5
1591	15	Dk 5	1	0.333	2.200	0.454	5
1592	16	Os	1	0.333	1.593	0.628	0
1593	H 39 SRF-4		—	—	—	—	—
1594	1	So	3	2.500	1.532	0.653	1
1595	2	Zr 1	2	0.833	1.149	0.871	2
1596	3	Sg	1	0.333	2.170	0.461	2
1597	4	Zr 2	2	0.750	0.893	1.119	3
1598	5	Tg	4	2.333	0.766	1.306	4
1599	6	Kc	1	0.250	1.404	0.712	5
1600	7	Rf	3	2.250	1.149	0.871	5
1601	8	Ts	2	1.250	1.276	0.783	5
1602	9	Dk 1	1	0.333	1.787	0.560	6
1603	10	Dk 2	1	0.333	1.787	0.560	6
1604	11	Bd	1	0.500	1.915	0.522	6
1605	12	Os	1	0.333	2.170	0.461	0
1606	H 6 SRF-5		—	—	—	—	—
1607	1	Zr 1	2	1.500	1.570	0.637	1
1608	2	Ts	2	0.833	0.981	1.019	2
1609	3	Tg	3	2.000	0.785	1.274	3
1610	4	Bd	1	0.333	1.766	0.566	4
1611	5	Rf	2	1.333	1.374	0.728	4
1612	6	Dk	1	0.500	2.355	0.425	5
1613	7	Os	1	0.500	2.552	0.392	0
1614	H141 TNF-1		—	—	—	—	—
1615	1	Zr	3	2.000	1.015	0.986	1
1616	2	So	2	0.500	0.676	1.478	2
1617	3	Kd	2	0.500	0.676	1.478	2
1618	4	Tg	6	5.000	0.338	2.957	3
1619	5	Bd	1	0.167	1.127	0.887	4
1620	6	Dk 1	1	0.167	1.127	0.887	4
1621	7	Dk 2	1	0.167	1.127	0.887	4
1622	8	Dk 3	1	0.167	1.127	0.887	4
1623	9	Os	1	0.333	1.804	0.554	0

APPENDIX17(20):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1624	H84 TNF-2		—	—	—	—	—
1625	1	Kg	2	1.500	1.748	0.572	1
1626	2	Zr 1	2	1.000	1.398	0.715	2
1627	3	Zr 2	2	1.000	1.075	0.931	3
1628	4	Sr	2	0.643	0.777	1.287	4
1629	5	Tg 1	7	3.783	0.505	1.981	5
1630	6	Rf 1	3	2.143	0.829	1.207	6
1631	7	Dk 1	1	0.143	0.880	1.136	6
1632	8	Tg 2	4	1.810	0.673	1.485	6
1633	9	Tg 3	5	4.143	0.777	1.287	6
1634	10	Kf	1	0.143	0.880	1.136	6
1635	11	Ts	2	0.343	0.751	1.332	6
1636	12	Dk 2	1	0.333	1.204	0.831	7
1637	13	Dk 3	1	0.333	1.204	0.831	7
1638	14	Bn	3	1.750	0.971	1.030	7
1639	15	Bd 1	1	0.250	1.049	0.954	7
1640	16	Rf 2	3	2.250	0.997	1.003	7
1641	17	Dk 4	1	0.200	1.152	0.868	7
1642	18	Dk 5	1	0.200	1.152	0.868	7
1643	19	Dk 6	1	0.200	1.152	0.868	7
1644	20	Dk 7	1	0.200	1.152	0.868	7
1645	21	Tg 4	5	4.500	1.023	0.978	7
1646	22	Kw	1	0.333	1.346	0.743	8
1647	23	Rf 3	2	1.333	1.320	0.757	8
1648	24	Dk 8	1	0.333	1.372	0.729	8
1649	25	Dk 9	1	0.333	1.372	0.729	8
1650	26	Bd 2	1	0.200	1.398	0.715	8
1651	27	Dk 10	1	0.200	1.398	0.715	8
1652	28	Dk 11	1	0.200	1.398	0.715	8
1653	29	Dk 12	1	0.200	1.398	0.715	8
1654	30	Dk 13	1	0.500	1.696	0.590	9
1655	31	Os	1	0.500	2.123	0.471	0
1656	H 70 TNF-3		—	—	—	—	—
1657	1	Zr 1	2	1.333	1.891	0.529	1
1658	2	Kg	3	1.333	1.457	0.687	2
1659	3	Tg 1	3	1.833	1.767	0.566	3
1660	4	Zr 2	2	0.833	1.333	0.750	3
1661	5	Rf 1	2	1.333	2.200	0.454	4
1662	6	Bd 1	1	0.333	2.262	0.442	4
1663	7	Zr 3	2	1.000	1.271	0.787	4
1664	8	Dk 1	1	0.500	2.696	0.371	5
1665	9	Zr 4	2	1.000	1.271	0.787	5
1666	10	So	2	0.700	1.333	0.750	6
1667	11	Tg 2	5	3.833	1.457	0.687	7
1668	12	Rf 2	3	2.200	1.829	0.547	8
1669	13	Wk	1	0.200	1.952	0.512	8
1670	14	Ms	1	0.200	1.952	0.512	8
1671	15	Kc	1	0.200	1.952	0.512	8
1672	16	Dk 2	1	0.333	2.324	0.430	9
1673	17	Dk 3	1	0.333	2.324	0.430	9
1674	18	Os	1	0.500	2.386	0.419	0
1675	H48 TNF-4		—	—	—	—	—
1676	1	Kg	2	1.500	2.310	0.433	1
1677	2	Zr 1	2	1.000	1.815	0.551	2
1678	3	Zr 2	2	1.000	1.430	0.699	3
1679	4	Zr 3	2	0.833	1.155	0.866	4
1680	5	Tg	3	1.750	0.990	1.010	5
1681	6	Bd	1	0.333	1.595	0.627	6
1682	7	Rf 1	4	2.833	1.045	0.957	6
1683	8	Dk 1	1	0.250	1.650	0.606	7
1684	9	Dk 2	1	0.250	1.650	0.606	7
1685	10	Bn	2	0.750	1.430	0.699	7
1686	11	Rf 2	2	1.500	1.925	0.520	8
1687	12	Dk 3	1	0.500	2.529	0.395	9
1688	13	Os	1	0.500	2.914	0.343	0
1689	H 94 TNF-5		—	—	—	—	—
1690	1	Sg	2	0.750	1.330	0.752	1
1691	2	Zr 1	4	1.500	0.877	1.140	1
1692	3	Zr 2	4	1.750	0.679	1.473	2
1693	4	Zr 3	4	1.500	0.792	1.262	2
1694	5	Kg	4	2.583	0.764	1.309	3
1695	6	Dk 1	1	0.250	1.160	0.862	3
1696	7	Bn	2	0.750	1.160	0.862	3
1697	8	Rf 1	2	1.250	1.217	0.822	3
1698	9	Tg	3	1.583	1.019	0.982	4
1699	10	Kc	1	0.250	1.245	0.803	4
1700	11	Bd	1	0.250	1.245	0.803	4
1701	12	Rf 2	2	1.500	1.585	0.631	4
1702	13	Dk 2	1	0.500	1.698	0.589	4
1703	14	Dk 3	1	0.333	1.500	0.667	5
1704	15	Ts	3	2.333	1.387	0.721	5
1705	16	Dk 4	1	0.500	2.066	0.484	5
1706	17	Dk 5	1	0.333	1.868	0.535	6
1707	18	Dk 6	1	0.333	1.868	0.535	6
1708	19	Os	2	0.750	1.330	0.752	0

APPENDIX17(21):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1709	H108 ZBR-1		—	—	—	—	—
1710	1	Zr 1	2	1.500	2.091	0.478	1
1711	2	Zr 2	2	1.000	1.545	0.647	2
1712	3	So 1	2	1.000	1.182	0.846	3
1713	4	So 2	2	0.750	1.000	1.000	4
1714	5	Tg	4	3.000	1.000	1.000	5
1715	6	Dk 1	1	0.250	1.727	0.579	6
1716	7	Bd	1	0.250	1.727	0.579	6
1717	8	Rf	2	1.250	1.545	0.647	6
1718	9	Dk 2	1	0.500	2.273	0.440	7
1719	10	Os	1	0.500	2.818	0.355	0
1720	H62 ZBR-2		—	—	—	—	—
1721	1	Zr 1	2	1.500	1.935	0.517	1
1722	2	So 1	2	1.000	1.480	0.676	2
1723	3	So 2	2	0.833	1.100	0.909	3
1724	4	Ts	3	1.333	0.797	1.255	4
1725	5	Bn	2	0.667	1.100	0.909	5
1726	6	Tg	3	1.083	0.873	1.146	5
1727	7	Rf 1	3	2.500	1.480	0.676	6
1728	8	Rf 2	4	3.333	1.176	0.850	6
1729	9	Bd 1	2	1.333	1.328	0.753	6
1730	10	Dk 1	1	0.333	2.011	0.497	7
1731	11	Dk 2	1	0.333	2.011	0.497	7
1732	12	Dk 3	1	0.250	1.707	0.586	7
1733	13	Dk 4	1	0.250	1.707	0.586	7
1734	14	Dk 5	1	0.250	1.707	0.586	7
1735	15	Bd 2	1	0.500	1.859	0.538	7
1736	16	Os	1	0.500	2.466	0.406	0
1737	H78 ZBR-3		—	—	—	—	—
1738	1	Zr 1	2	1.143	1.127	0.887	1
1739	2	Tg 1	7	5.000	0.719	1.390	2
1740	3	Bd	2	1.143	1.127	0.887	3
1741	4	Dk 1	1	0.143	1.175	0.851	3
1742	5	Ts	2	0.393	0.791	1.264	3
1743	6	Dk 2	1	0.143	1.175	0.851	3
1744	7	Bn 1	2	0.643	1.031	0.970	3
1745	8	Dk 3	1	0.143	1.175	0.851	3
1746	9	Ms	1	0.500	1.582	0.632	4
1747	10	Tg 2	4	2.500	0.911	1.098	4
1748	11	Rf 1	2	1.000	1.390	0.719	4
1749	12	Bn 2	2	0.750	1.223	0.818	5
1750	13	Dk 4	1	0.250	1.367	0.732	5
1751	14	Rf 2	2	1.250	1.319	0.758	5
1752	15	Dk 5	2	1.500	1.798	0.556	5
1753	16	Rf 3	2	1.000	1.582	0.632	6
1754	17	Dk 6	1	0.500	1.774	0.564	6
1755	18	Dk 7	1	0.500	2.254	0.444	6
1756	19	Dk 8	2	1.500	1.990	0.503	7
1757	20	Dk 9	1	0.500	2.445	0.409	8
1758	21	Os	1	0.500	1.582	0.632	0
1759	H128 ZBR-4		—	—	—	—	—
1760	1	Zr	2	1.333	1.200	0.833	1
1761	2	Kg	3	1.333	0.800	1.250	2
1762	3	So 1	2	0.500	0.844	1.184	3
1763	4	So 2	3	1.033	0.889	1.125	3
1764	5	Tg 1	6	4.000	0.933	1.071	4
1765	6	Tg 2	2	0.833	1.244	0.804	4
1766	7	Rf 1	5	4.333	1.156	0.865	4
1767	8	Rf 2	2	1.167	1.333	0.750	5
1768	9	Rf 3	2	1.167	1.333	0.750	5
1769	10	Rf 4	2	1.167	1.333	0.750	5
1770	11	Dk 1	1	0.167	1.378	0.726	5
1771	12	Ms	1	0.167	1.378	0.726	5
1772	13	Rf 5	2	1.500	1.644	0.608	5
1773	14	Dk 2	1	0.200	1.600	0.625	5
1774	15	Dk 3	1	0.200	1.600	0.625	5
1775	16	Dk 4	1	0.200	1.600	0.625	5
1776	17	Bd	1	0.200	1.600	0.625	5
1777	18	Dk 5	1	0.500	1.778	0.563	6
1778	19	Dk 6	1	0.500	1.778	0.563	6
1779	20	Dk 7	1	0.500	1.778	0.563	6
1780	21	Dk 8	1	0.500	2.089	0.479	6
1781	22	Os	1	0.500	1.644	0.608	0
1782	H116 ZBR-5		—	—	—	—	—
1783	1	Zr 1	2	1.500	1.265	0.791	1
1784	2	Zr 2	2	0.667	0.770	1.299	2
1785	3	Tg	6	4.250	0.385	2.598	3
1786	4	Rf 1	4	3.167	0.660	1.515	4
1787	5	Dk 1	1	0.167	0.990	1.010	4
1788	6	Ms	1	0.167	0.990	1.010	4
1789	7	Dk 2	1	0.167	0.990	1.010	4
1790	8	Rf 2	2	1.167	0.880	1.137	4
1791	9	Dk 3	1	0.250	1.265	0.791	5
1792	10	Dk 4	1	0.250	1.265	0.791	5
1793	11	Dk 5	1	0.250	1.265	0.791	5
1794	12	Dk 6	1	0.500	1.485	0.674	5
1795	13	Os	1	0.500	1.870	0.535	0

APPENDIX17(22):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
1796	H 7 ADK-1		—	—	—	—	—
1797	1	Zr 1	2	1.500	1.595	0.627	1
1798	2	Zr 2	2	0.833	1.015	0.985	2
1799	3	Tg 1	3	1.833	0.725	1.379	3
1800	4	Bd	1	0.333	1.595	0.627	4
1801	5	Tg 2	3	2.333	1.015	0.985	4
1802	6	Dk 1	1	0.333	1.885	0.530	5
1803	7	Dk 2	1	0.333	1.885	0.530	5
1804	8	Os	1	0.500	2.465	0.406	0
1805	H90 ADK-2		—	—	—	—	—
1806	1	Sg	2	0.833	1.593	0.628	1
1807	2	So 1	3	1.333	1.100	0.909	1
1808	3	So 2	3	1.533	0.721	1.387	2
1809	4	Dk 1	1	0.333	1.252	0.799	3
1810	5	Tg 1	5	2.917	0.493	2.028	3
1811	6	Rf 1	4	3.200	0.797	1.255	4
1812	7	Kc	1	0.200	1.024	0.976	4
1813	8	Dk 2	1	0.200	1.024	0.976	4
1814	9	Tg 2	3	1.700	0.797	1.255	4
1815	10	Dk 3	1	0.250	1.328	0.753	5
1816	11	Dk 4	1	0.250	1.328	0.753	5
1817	12	Dk 5	1	0.250	1.328	0.753	5
1818	13	Rf 2	2	1.333	1.252	0.799	5
1819	14	Bd	1	0.333	1.328	0.753	5
1820	15	Dk 6	1	0.500	1.783	0.561	6
1821	16	Os	2	0.833	1.593	0.628	0
1822	H18 ADK-3		—	—	—	—	—
1823	1	Kg	2	1.500	1.545	0.647	1
1824	2	Zr	2	0.833	1.000	1.000	2
1825	3	Ts	3	1.250	0.636	1.571	3
1826	4	Rf	2	1.333	1.182	0.846	4
1827	5	Tg	4	3.333	0.818	1.222	4
1828	6	Dk 1	1	0.500	1.909	0.524	5
1829	7	Kc	1	0.250	1.545	0.647	5
1830	8	Ms	1	0.250	1.545	0.647	5
1831	9	Dk 2	1	0.250	1.545	0.647	5
1832	10	Os	1	0.500	2.273	0.440	0
1833	H146 ADK4		—	—	—	—	—
1834	1	Zr	2	1.333	1.275	0.784	1
1835	2	Kg 1	3	1.083	0.889	1.125	2
1836	3	Ts	3	2.333	1.236	0.809	3
1837	4	Kg 2	4	1.917	0.657	1.523	3
1838	5	Dk 1	1	0.333	1.661	0.602	4
1839	6	Bd 1	1	0.333	1.661	0.602	4
1840	7	Tg 1	4	2.750	0.927	1.079	4
1841	8	Sr 1	3	0.833	0.695	1.438	4
1842	9	Rf 1	1	0.250	1.082	0.925	4
1843	10	Rf 2	2	1.250	1.313	0.761	5
1844	11	Dk 2	1	0.250	1.352	0.740	5
1845	12	Ms 1	1	0.250	1.352	0.740	5
1846	13	Tg 2	4	2.833	0.966	1.035	5
1847	14	Tg 3	3	1.667	0.966	1.035	5
1848	15	Dk 3	1	0.500	1.738	0.575	6
1849	16	Rf 3	2	1.250	1.352	0.740	6
1850	17	Dk 4	1	0.250	1.391	0.719	6
1851	18	Bd 2	1	0.250	1.391	0.719	6
1852	19	Rf 4	3	2.333	1.313	0.761	6
1853	20	Ms 2	1	0.333	1.391	0.719	6
1854	21	Dk 5	1	0.500	1.777	0.563	7
1855	22	Dk 6	1	0.333	1.738	0.575	7
1856	23	Dk 7	1	0.333	1.738	0.575	7
1857	24	Os	1	0.500	1.700	0.588	0
1858	H143 ADK5		—	—	—	—	—
1859	1	Zr	2	1.500	1.643	0.609	1
1860	2	So	2	0.750	1.209	0.827	2
1861	3	Kg	4	2.833	0.837	1.195	3
1862	4	Bd	1	0.250	1.333	0.750	4
1863	5	Tg 1	3	0.950	0.651	1.536	4
1864	6	Dk 1	1	0.250	1.333	0.750	4
1865	7	Rf 1	2	1.333	1.085	0.922	5
1866	8	Tg 2	5	2.333	0.651	1.536	5
1867	9	Dk 2	1	0.500	1.581	0.633	6
1868	10	Rf 2	2	1.200	1.085	0.922	6
1869	11	Rf 3	2	1.200	1.085	0.922	6
1870	12	Rf 4	2	1.200	1.085	0.922	6
1871	13	Rf 5	2	1.200	1.085	0.922	6
1872	14	Dk 3	1	0.500	1.581	0.633	7
1873	15	Dk 4	1	0.500	1.581	0.633	7
1874	16	Dk 5	1	0.500	1.581	0.633	7
1875	17	Dk 6	1	0.500	1.581	0.633	7
1876	18	Os	1	0.500	2.138	0.468	0
1877	H111 CDY1		—	—	—	—	—
1878	1	Zr 1	2	1.500	2.106	0.475	1
1879	2	Zr 2	2	1.000	1.595	0.627	2
1880	3	Zr 3	2	0.833	1.213	0.825	3
1881	4	Tg	3	1.833	0.957	1.045	4
1882	5	Bd	1	0.333	1.595	0.627	5
1883	6	Rf 1	3	1.333	0.957	1.045	5
1884	7	Bn	2	0.833	1.340	0.746	6
1885	8	Rf 2	2	1.333	1.468	0.681	6
1886	9	Rf 3	2	1.500	1.851	0.540	7
1887	10	Dk 1	1	0.500	2.106	0.475	7
1888	11	Dk 2	1	0.500	2.489	0.402	8
1889	12	Os	1	0.500	2.744	0.364	0

APPENDIX17(23):RRAMEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
1890	H28	CDY2	—	—	—	—	—
1891	1	Zr 1	2	1.500	1.507	0.664	1
1892	2	Zr 2	2	0.750	0.980	1.021	2
1893	3	Tg	4	2.333	0.603	1.659	3
1894	4	Rf 1	3	2.250	0.980	1.021	4
1895	5	Bd	1	0.250	1.281	0.781	4
1896	6	Bn	2	0.750	0.980	1.021	4
1897	7	Dk 1	1	0.333	1.658	0.603	5
1898	8	Dk 2	1	0.333	1.658	0.603	5
1899	9	Rf 2	2	1.500	1.507	0.664	5
1900	10	Dk 3	1	0.500	2.185	0.458	6
1901	11	Os	1	0.500	2.185	0.458	0
1902	H51	CDY3	—	—	—	—	—
1903	1	Zr 1	2	1.500	2.018	0.496	1
1904	2	Zr 2	2	1.000	1.538	0.650	2
1905	3	Zr 3	2	1.000	1.153	0.867	3
1906	4	Zr 4	2	0.700	0.865	1.156	4
1907	5	Tg	5	3.250	0.673	1.487	5
1908	6	Kc	1	0.200	1.249	0.800	6
1909	7	Rf 1	4	3.200	0.961	1.041	6
1910	8	Bd	1	0.200	1.249	0.800	6
1911	9	Rf 2	2	1.200	1.153	0.867	6
1912	10	Dk 1	1	0.250	1.538	0.650	7
1913	11	Dk 2	1	0.250	1.538	0.650	7
1914	12	Dk 3	1	0.250	1.538	0.650	7
1915	13	Dk 4	1	0.500	1.730	0.578	7
1916	14	Os	1	0.500	2.595	0.385	0
1917	H114	CDY4	—	—	—	—	—
1918	1	Zr 1	2	1.333	1.815	0.551	1
1919	2	Zr 2	3	2.000	1.320	0.758	2
1920	3	Dk 1	1	0.333	1.925	0.520	3
1921	4	Zr 3	2	0.833	1.045	0.957	3
1922	5	Zr 4	2	0.700	0.880	1.137	4
1923	6	Tg	5	3.500	0.825	1.212	5
1924	7	Bd	1	0.200	1.430	0.699	6
1925	8	Kc	1	0.200	1.430	0.699	6
1926	9	Rf 1	2	1.200	1.320	0.758	6
1927	10	Rf 2	2	1.200	1.320	0.758	6
1928	11	Dk 2	1	0.500	1.925	0.520	7
1929	12	Dk 3	1	0.500	1.925	0.520	7
1930	13	Os	1	0.500	2.419	0.413	0
1931	H120	CDY5	—	—	—	—	—
1932	1	Zr	2	1.125	0.765	1.308	1
1933	2	Tg	8	5.833	0.297	3.363	2
1934	3	Ms	1	0.125	0.850	1.177	3
1935	4	Dk 1	1	0.125	0.850	1.177	3
1936	5	Rf 1	2	1.125	0.765	1.308	3
1937	6	Rf 2	3	1.625	0.595	1.681	3
1938	7	Kc	1	0.125	0.850	1.177	3
1939	8	Tt	1	0.125	0.850	1.177	3
1940	9	Bn	2	1.125	0.765	1.308	3
1941	10	Dk 2	1	0.500	1.317	0.759	4
1942	11	Dk 3	2	1.333	1.062	0.942	4
1943	12	Dk 4	1	0.333	1.147	0.872	4
1944	13	Dk 5	1	0.500	1.317	0.759	4
1945	14	Dk 6	1	0.500	1.614	0.619	5
1946	15	Os	1	0.500	1.317	0.759	0
1947	H13	DAL-1	—	—	—	—	—
1948	1	Zr 1	2	1.333	1.127	0.887	1
1949	2	Zr 2	3	1.700	0.564	1.774	2
1950	3	Sg	1	0.333	1.353	0.739	3
1951	4	Tg	5	4.333	0.451	2.218	3
1952	5	Bd	1	0.200	1.240	0.806	4
1953	6	Dk 1	1	0.200	1.240	0.806	4
1954	7	Dk 2	1	0.200	1.240	0.806	4
1955	8	Dk 3	1	0.200	1.240	0.806	4
1956	9	Os	1	0.500	1.916	0.522	0

APPENDIX17(24):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
1957	H131	DAL-2	–	–	–	–	–
1958	1	Fr	3	2.000	1.580	0.633	1
1959	2	Zr 1	2	0.833	1.474	0.678	2
1960	3	Zr 2	2	0.833	1.721	0.581	2
1961	4	So 1	2	0.833	1.386	0.722	3
1962	5	So 2	2	0.833	1.880	0.532	3
1963	6	So 3	3	1.333	1.315	0.760	4
1964	7	So 4	3	1.333	2.057	0.486	4
1965	8	Bn 1	3	1.833	1.598	0.626	5
1966	9	So 5	2	0.533	1.333	0.750	5
1967	10	Bn 2	2	0.667	2.339	0.428	5
1968	11	Tg 1	3	1.667	2.321	0.431	5
1969	12	Rf 1	2	1.333	1.915	0.522	6
1970	13	Dk 1	1	0.333	1.933	0.517	6
1971	14	Tg 2	5	2.833	1.368	0.731	6
1972	15	Rf 2	3	2.500	2.639	0.379	6
1973	16	Rf 3	3	2.333	2.621	0.381	6
1974	17	Bd 1	1	0.333	2.657	0.376	6
1975	18	Dk 2	1	0.500	2.251	0.444	7
1976	19	Bd 2	1	0.200	1.703	0.587	7
1977	20	Rf 4	2	1.200	1.686	0.593	7
1978	21	Sr	2	1.200	1.686	0.593	7
1979	22	Ts	3	0.950	1.509	0.663	7
1980	23	Dk 3	1	0.333	2.974	0.336	7
1981	24	Dk 4	1	0.333	2.974	0.336	7
1982	25	Dk 5	1	0.333	2.957	0.338	7
1983	26	Dk 6	1	0.333	2.957	0.338	7
1984	27	Dk 7	1	0.500	2.021	0.495	8
1985	28	Bd 3	1	0.500	2.021	0.495	8
1986	29	Bn 3	2	0.833	1.809	0.553	8
1987	30	Tg 3	4	2.533	1.721	0.581	8
1988	31	Rf 5	2	1.500	2.127	0.470	9
1989	32	Bd 3	1	0.250	2.057	0.486	9
1990	33	Dk 8	1	0.250	2.057	0.486	9
1991	34	Rf 6	5	4.250	1.986	0.504	9
1992	35	Dk 9	1	0.500	2.463	0.406	10
1993	36	Dk 10	1	0.200	2.321	0.431	10
1994	37	Dk 11	1	0.200	2.321	0.431	10
1995	38	Dk 12	1	0.200	2.321	0.431	10
1996	39	Dk 13	1	0.200	2.321	0.431	10
1997	40	Os	1	0.333	1.915	0.522	0
1998	H112	DAL-3	–	–	–	–	–
1999	1	Zr 1	2	1.500	1.659	0.603	1
2000	2	Zr 2	2	1.000	1.149	0.871	2
2001	3	Zr 3	2	0.667	0.766	1.306	3
2002	4	Tg 1	6	4.833	0.511	1.959	4
2003	5	Tg 2	3	2.167	0.893	1.119	5
2004	6	Bd	1	0.167	1.149	0.871	5
2005	7	Dk 1	1	0.167	1.149	0.871	5
2006	8	Dk 2	1	0.167	1.149	0.871	5
2007	9	Dk 3	1	0.167	1.149	0.871	5
2008	10	Dk 4	1	0.333	1.532	0.653	6
2009	11	Ms	1	0.333	1.532	0.653	6
2010	12	Os	1	0.500	2.297	0.435	0
2011	H14	DAL-4	–	–	–	–	–
2012	1	Zr 1	2	1.500	1.916	0.522	1
2013	2	So	2	1.000	1.353	0.739	2
2014	3	Zr 2	2	0.833	1.015	0.986	3
2015	4	Tg	3	1.833	0.902	1.109	4
2016	5	Rf	3	2.333	1.240	0.806	5
2017	6	Ms	1	0.333	1.691	0.591	5
2018	7	Dk 1	1	0.333	2.029	0.493	6
2019	8	Dk 2	1	0.333	2.029	0.493	6
2020	9	Os	1	0.500	2.706	0.370	0
2021	H 15	DAL-5	–	–	–	–	–
2022	1	Zr 1	2	1.500	1.466	0.682	1
2023	2	Zr 2	2	0.750	0.902	1.109	2
2024	3	Tg	4	2.833	0.564	1.774	3
2025	4	Rf	3	2.250	0.902	1.109	4
2026	5	Kc	1	0.250	1.353	0.739	4
2027	6	Bd	1	0.250	1.353	0.739	4
2028	7	Dk 1	1	0.333	1.691	0.591	5
2029	8	Dk 2	1	0.333	1.691	0.591	5
2030	9	Os	1	0.500	2.255	0.444	0
2031	H 3	DNL-1	–	–	–	–	–
2032	1	Zr 1	2	1.500	1.658	0.603	1
2033	2	Zr 2	2	0.833	1.130	0.885	2
2034	3	So	3	1.333	0.754	1.327	3
2035	4	Bn	2	0.833	1.130	0.885	4
2036	5	Tg 1	3	1.833	0.980	1.021	4
2037	6	Rf	2	1.500	1.658	0.603	5
2038	7	Dk 1	1	0.333	1.658	0.603	5
2039	8	Tg 2	2	1.333	1.507	0.664	5
2040	9	Dk 2	1	0.500	2.336	0.428	6
2041	10	Bd	1	0.500	2.185	0.458	6
2042	11	Os	1	0.500	2.336	0.428	0

APPENDIX17(25):RRAMEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2043	H36 DNL-2		—	—	—	—	—
2044	1	Zr 1	2	1.500	1.595	0.627	1
2045	2	Zr 2	2	0.833	1.085	0.922	2
2046	3	So	3	1.250	0.702	1.424	3
2047	4	Bn	2	0.833	1.085	0.922	4
2048	5	Tg	4	2.833	0.830	1.205	4
2049	6	Rf 1	2	1.500	1.595	0.627	5
2050	7	Rf 2	2	1.250	1.340	0.746	5
2051	8	Bd	1	0.250	1.468	0.681	5
2052	9	Ms	1	0.250	1.468	0.681	5
2053	10	Dk 1	1	0.500	2.234	0.448	6
2054	11	Dk 2	1	0.500	1.978	0.505	6
2055	12	Os	1	0.500	2.234	0.448	0
2056	H29 DNL-3		—	—	—	—	—
2057	1	Zr 1	2	1.500	2.336	0.428	1
2058	2	Zr 2	2	1.000	1.809	0.553	2
2059	3	Kg 1	2	1.000	1.432	0.698	3
2060	4	Kg 2	2	1.000	1.206	0.829	4
2061	5	Sr	2	0.750	1.130	0.885	5
2062	6	Tg	4	3.000	1.206	0.829	6
2063	7	Dk 1	1	0.250	1.884	0.531	7
2064	8	Rf	2	1.250	1.733	0.577	7
2065	9	Bd	1	0.250	1.884	0.531	7
2066	10	Dk 2	1	0.500	2.411	0.415	8
2067	11	Os	1	0.500	3.014	0.332	0
2068	H74 DNL-4		—	—	—	—	—
2069	1	Zr 1	3	2.333	1.351	0.740	1
2070	2	So 1	3	1.333	0.987	1.013	2
2071	3	Sg	1	0.333	1.819	0.550	2
2072	4	So 2	2	0.583	0.935	1.069	3
2073	5	So 3	2	0.583	1.247	0.802	3
2074	6	So 4	4	2.750	0.935	1.069	4
2075	7	Tg 1	4	3.500	1.559	0.642	4
2076	8	Tg 2	4	2.250	1.091	0.916	5
2077	9	Dk 1	1	0.250	1.403	0.713	5
2078	10	Dk 2	1	0.250	1.403	0.713	5
2079	11	Dk 3	1	0.250	2.026	0.493	5
2080	12	Dk 4	1	0.250	2.026	0.493	5
2081	13	Bd	1	0.250	2.026	0.493	5
2082	14	Rf 1	2	1.250	1.507	0.664	6
2083	15	Bn	2	0.750	1.455	0.687	6
2084	16	Ms	1	0.250	1.559	0.642	6
2085	17	Dk 5	1	0.500	1.975	0.506	7
2086	18	Rf 2	2	1.500	1.871	0.535	7
2087	19	Dk 6	1	0.500	2.338	0.428	8
2088	20	Os	1	0.333	1.819	0.550	0
2089	H127 DNL-5		—	—	—	—	—
2090	1	Zr	2	1.500	1.641	0.609	1
2091	2	So 1	2	0.833	1.217	0.822	2
2092	3	So 2	3	1.333	0.849	1.178	3
2093	4	Bn	2	0.833	1.217	0.822	4
2094	5	So 3	3	1.033	0.707	1.414	4
2095	6	Rf 1	2	1.500	1.641	0.609	5
2096	7	Rf 2	2	1.333	1.132	0.884	5
2097	8	Tg	5	3.533	0.736	1.359	5
2098	9	Dk 1	1	0.500	2.122	0.471	6
2099	10	Dk 2	1	0.500	1.613	0.620	6
2100	11	Rf 3	5	4.200	0.990	1.010	6
2101	12	Kc	1	0.200	1.217	0.822	6
2102	13	Ms	1	0.200	1.217	0.822	6
2103	14	Bd	1	0.200	1.217	0.822	6
2104	15	Dk 3	1	0.200	1.471	0.680	7
2105	16	Dk 4	1	0.200	1.471	0.680	7
2106	17	Dk 5	1	0.200	1.471	0.680	7
2107	18	Dk 6	1	0.200	1.471	0.680	7
2108	19	Os	1	0.500	2.122	0.471	0
2109	H96 DKR-1		—	—	—	—	—
2110	1	Zr	3	1.833	1.965	0.509	1
2111	2	So 1	3	1.333	1.592	0.628	1
2112	3	Dk 1	1	0.333	2.399	0.417	2
2113	4	So 2	2	0.833	1.282	0.780	2
2114	5	So 3	2	0.833	1.013	0.987	3
2115	6	Ts	3	1.643	0.786	1.273	4
2116	7	Tg	7	5.033	0.641	1.560	5
2117	8	Dk 2	1	0.333	1.220	0.820	5
2118	9	Bn	2	0.393	0.910	1.099	6
2119	10	Dk 3	1	0.143	1.075	0.930	6
2120	11	Dk 4	1	0.143	1.075	0.930	6
2121	12	Bd	1	0.143	1.075	0.930	6
2122	13	Kc	1	0.143	1.075	0.930	6
2123	14	Rf 1	5	4.143	0.910	1.099	6
2124	15	Rf 2	4	3.500	1.220	0.820	7
2125	16	Dk 5	1	0.200	1.344	0.744	7
2126	17	Dk 6	1	0.200	1.344	0.744	7
2127	18	Dk 7	1	0.200	1.344	0.744	7
2128	19	Dk 8	1	0.200	1.344	0.744	7
2129	20	Dk 9	1	0.250	1.654	0.604	8
2130	21	Dk 10	1	0.250	1.654	0.604	8
2131	22	Dk 11	1	0.250	1.654	0.604	8
2132	23	Os	2	0.667	1.985	0.504	0

APPENDIX17(26):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2133	H142	DKR2	—	—	—	—	—
2134	1	Zr	3	1.333	0.935	1.070	1
2135	2	Sg	2	1.000	1.869	0.535	1
2136	3	Sr	3	1.033	0.637	1.569	2
2137	4	So	2	0.833	1.402	0.713	2
2138	5	Bn	2	0.833	1.020	0.981	3
2139	6	Tg	5	3.667	0.680	1.471	3
2140	7	Rf 1	2	1.500	1.487	0.673	4
2141	8	Dk 1	1	0.200	1.232	0.812	4
2142	9	Kc	1	0.200	1.232	0.812	4
2143	10	Bd	1	0.200	1.232	0.812	4
2144	11	Rf 2	3	2.200	1.062	0.942	4
2145	12	Dk 2	1	0.500	2.039	0.490	5
2146	13	Dk 3	1	0.333	1.614	0.619	5
2147	14	Dk 4	1	0.333	1.614	0.619	5
2148	15	Os	2	0.833	1.402	0.713	0
2149	H140	DKR3	—	—	—	—	—
2150	1	Zr 1	2	1.500	1.273	0.785	1
2151	2	Zr 2	2	0.700	0.849	1.178	2
2152	3	Tg 1	5	2.500	0.481	2.079	3
2153	4	Rf 1	2	1.200	0.905	1.104	4
2154	5	Kc	1	0.200	0.962	1.039	4
2155	6	Rf 2	3	2.200	0.849	1.178	4
2156	7	Tg 2	6	3.700	0.509	1.963	4
2157	8	Dk 1	1	0.500	1.387	0.721	5
2158	9	Dk 2	1	0.333	1.330	0.752	5
2159	10	Dk 3	1	0.333	1.330	0.752	5
2160	11	Bd 1	1	0.167	0.990	1.010	5
2161	12	Bd 2	1	0.167	0.990	1.010	5
2162	13	Rf 3	2	1.167	0.934	1.071	5
2163	14	Rf 4	2	1.167	0.934	1.071	5
2164	15	Rf 5	2	1.167	0.934	1.071	5
2165	16	Dk 4	1	0.500	1.415	0.707	6
2166	17	Dk 5	1	0.500	1.415	0.707	6
2167	18	Dk 6	1	0.500	1.415	0.707	6
2168	19	Os	1	0.500	1.754	0.570	0
2169	H89	DKR4	—	—	—	—	—
2170	1	Zr 1	4	2.333	1.057	0.946	1
2171	2	Sg	2	0.750	1.586	0.631	1
2172	3	Dk 1	1	0.250	1.634	0.612	2
2173	4	Zr 2	3	1.083	0.769	1.301	2
2174	5	Bn	2	0.833	1.153	0.867	3
2175	6	Tg 1	3	1.833	0.865	1.156	3
2176	7	Rf 1	2	1.500	1.634	0.612	4
2177	8	Bd	1	0.333	1.442	0.694	4
2178	9	Tg 2	2	0.667	1.153	0.867	4
2179	10	Dk 2	1	0.500	2.210	0.452	5
2180	11	Rf 2	3	2.500	1.538	0.650	5
2181	12	Dk 3	1	0.333	2.114	0.473	6
2182	13	Dk 4	1	0.333	2.114	0.473	6
2183	14	Os	2	0.750	1.586	0.631	0
2184	H52	DKR5	—	—	—	—	—
2185	1	Zr	2	1.500	1.586	0.631	1
2186	2	So 1	2	0.833	1.105	0.905	2
2187	3	So 2	3	1.250	0.721	1.387	3
2188	4	Bn	2	0.833	1.105	0.905	4
2189	5	Tg	4	2.583	0.721	1.387	4
2190	6	Rf 1	2	1.500	1.586	0.631	5
2191	7	Kc	1	0.250	1.297	0.771	5
2192	8	Rf 2	4	3.250	1.009	0.991	5
2193	9	Bd	1	0.250	1.297	0.771	5
2194	10	Dk 1	1	0.500	2.162	0.462	6
2195	11	Dk 2	1	0.250	1.586	0.631	6
2196	12	Dk 3	1	0.250	1.586	0.631	6
2197	13	Dk 4	1	0.250	1.586	0.631	6
2198	14	Os	1	0.500	2.162	0.462	0

APPENDIX17(27):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
2199	H83 MDB1		—	—	—	—	—
2200	1	Zr 1	3	2.500	1.797	0.556	1
2201	2	Sg	1	0.333	2.178	0.459	2
2202	3	So 1	2	0.833	1.470	0.680	2
2203	4	So 2	2	0.833	1.171	0.854	3
2204	5	Kg 1	3	1.333	0.899	1.113	4
2205	6	Kg 2	3	1.167	0.817	1.224	5
2206	7	Kg 3	2	0.583	1.144	0.874	5
2207	8	So 3	2	0.533	1.035	0.966	6
2208	9	Zr 2	3	1.033	0.953	1.049	6
2209	10	Tg 1	4	3.000	1.416	0.706	6
2210	11	Tg 2	5	4.000	1.280	0.781	7
2211	12	Rf 1	2	1.333	1.307	0.765	7
2212	13	Tg 3	5	3.667	1.171	0.854	7
2213	14	Bd 1	1	0.250	1.797	0.556	7
2214	15	Dk 1	1	0.250	1.797	0.556	7
2215	16	Rf 2	2	1.250	1.770	0.565	8
2216	17	Rf 3	2	1.200	1.634	0.612	8
2217	18	Dk 2	1	0.200	1.661	0.602	8
2218	19	Bd 2	1	0.200	1.661	0.602	8
2219	20	Bd 3	1	0.200	1.661	0.602	8
2220	21	Dk 3	1	0.500	1.688	0.592	8
2221	22	Kc	1	0.200	1.552	0.644	8
2222	23	Bd 3	1	0.200	1.552	0.644	8
2223	24	Dk 4	1	0.200	1.552	0.644	8
2224	25	Rf 4	3	2.200	1.498	0.668	8
2225	26	Dk 5	1	0.500	2.151	0.465	8
2226	27	Dk 6	1	0.500	2.015	0.496	9
2227	28	Dk 7	1	0.333	1.879	0.532	9
2228	29	Dk 8	1	0.333	1.879	0.532	9
2229	30	Os	1	0.333	2.178	0.459	0
2230	H 58 MDB2		—	—	—	—	—
2231	1	Zr 1	2	1.500	1.827	0.547	1
2232	2	Zr 2	2	1.000	1.359	0.736	2
2233	3	Zr 3	2	0.833	0.977	1.023	3
2234	4	Zr 4	3	1.033	0.680	1.471	4
2235	5	Tg 1	3	2.333	1.062	0.942	5
2236	6	Tg 2	5	3.667	0.722	1.385	5
2237	7	Dk 1	1	0.333	1.614	0.619	6
2238	8	Dk 2	1	0.333	1.614	0.619	6
2239	9	Dk 3	1	0.200	1.275	0.785	6
2240	10	Rf	3	2.200	1.105	0.905	6
2241	11	Kc	1	0.200	1.275	0.785	6
2242	12	Bd	1	0.200	1.275	0.785	6
2243	13	Dk 4	1	0.333	1.657	0.604	7
2244	14	Dk 5	1	0.333	1.657	0.604	7
2245	15	Os	1	0.500	2.379	0.420	—
2246	H 53 MDB3		—	—	—	—	—
2247	1	Zr 1	2	1.500	2.451	0.408	1
2248	2	Zr 2	2	1.000	1.970	0.508	2
2249	3	Zr 3	2	1.000	1.586	0.631	3
2250	4	Kg	2	0.833	1.297	0.771	4
2251	5	So 1	3	2.000	1.105	0.905	5
2252	6	Dk 1	1	0.333	1.682	0.595	6
2253	7	So 2	2	0.583	1.105	0.905	6
2254	8	Tg	4	2.833	1.201	0.832	7
2255	9	Bd	1	0.250	1.778	0.562	8
2256	10	St	1	0.250	1.778	0.562	8
2257	11	Rf	3	2.250	1.586	0.631	8
2258	12	Dk 2	1	0.333	2.162	0.462	9
2259	13	Dk 3	1	0.333	2.162	0.462	9
2260	14	Os	1	0.500	3.027	0.330	0

APPENDIX17(28):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2261	H156	MDB4	—	—	—	—	—
2262	1	Zr 1	3	1.083	0.918	1.089	1
2263	2	Sg 2	2	0.667	1.236	0.809	1
2264	3	Kg 1	4	1.250	0.636	1.574	2
2265	4	Tg 1	6	3.083	0.777	1.287	3
2266	5	Tg 2	4	1.917	0.662	1.511	3
2267	6	So 1	2	0.583	0.883	1.133	3
2268	7	Rf 1	2	1.167	1.094	0.914	4
2269	8	Dk 1	1	0.167	1.112	0.899	4
2270	9	Rf 2	3	2.167	1.077	0.929	4
2271	10	Rf 3	2	0.667	0.953	1.049	4
2272	11	Rf 4	2	1.167	1.094	0.914	4
2273	12	Bd 1	1	0.250	0.997	1.003	4
2274	13	Rf 5	2	1.250	0.980	1.021	4
2275	14	Tg 3	6	2.917	0.741	1.349	4
2276	15	Tg 4	3	1.833	1.147	0.872	4
2277	16	Dk 2	1	0.500	1.430	0.699	5
2278	17	Dk 3	1	0.333	1.412	0.708	5
2279	18	Dk 4	1	0.333	1.412	0.708	5
2280	19	Dk 5	2	0.833	1.006	0.994	5
2281	20	Dk 6	1	0.500	1.430	0.699	5
2282	21	Dk 7	1	0.500	1.315	0.760	5
2283	22	Rf 6	1	0.167	1.077	0.929	5
2284	23	Rf 7	3	1.667	0.944	1.059	5
2285	24	Rf 8	2	1.167	1.059	0.944	5
2286	25	Dk 8	2	1.167	1.059	0.944	5
2287	26	Sr	3	1.000	0.989	1.012	5
2288	27	Bd 2	1	0.333	1.483	0.674	5
2289	28	Rf 10	3	2.333	1.448	0.691	5
2290	29	Dk 9	1	0.333	1.280	0.781	6
2291	30	Dk 10	1	0.500	1.395	0.717	6
2292	31	Dk 11	1	0.500	1.395	0.717	6
2293	32	Rf 11	2	1.333	1.306	0.766	6
2294	33	Rf 12	3	2.333	1.289	0.776	6
2295	34	Dk 12	1	0.333	1.783	0.561	6
2296	35	Dk 13	1	0.333	1.783	0.561	6
2297	36	Dk 14	1	0.500	1.642	0.609	7
2298	37	Dk 15	1	0.333	1.624	0.616	7
2299	38	Dk 16	1	0.333	1.624	0.616	7
2300	39	Sg 1	1	0.333	1.562	0.640	1
2301	40	Os	3	1.833	1.227	0.815	0
2302	H104	MDB5	—	—	—	—	—
2303	1	Zr	2	1.250	0.981	1.019	1
2304	2	Tg	4	3.000	0.393	2.547	2
2305	3	Bd	1	0.250	1.374	0.728	3
2306	4	Rf	2	1.250	0.981	1.019	3
2307	5	Dk 1	1	0.250	1.374	0.728	3
2308	6	Dk 2	1	0.500	1.963	0.509	4
2309	7	Os	1	0.500	1.963	0.509	0
2310	H 9	TMK1	—	—	—	—	—
2311	1	Zr	2	1.250	1.015	0.985	1
2312	2	Tg	4	2.833	0.435	2.299	2
2313	3	Ms	1	0.250	1.305	0.766	3
2314	4	Rf	3	2.250	0.725	1.379	3
2315	5	Kc	1	0.250	1.305	0.766	3
2316	6	Dk 1	1	0.333	1.595	0.627	4
2317	7	Dk 2	1	0.333	1.595	0.627	4
2318	8	Os	1	0.500	1.885	0.530	0
2319	H 40	TMK2	—	—	—	—	—
2320	1	Zr 1	3	2.000	1.468	0.681	1
2321	2	Zr 2	2	1.333	1.978	0.505	2
2322	3	Zr 3	2	0.833	1.213	0.825	2
2323	4	Dk 1	1	0.500	2.617	0.382	3
2324	5	Zr 4	2	0.833	1.085	0.922	3
2325	6	Tg	3	1.833	1.085	0.922	4
2326	7	Bd	1	0.333	1.723	0.580	5
2327	8	Ts	3	1.833	1.340	0.746	5
2328	9	Kc	1	0.333	1.978	0.505	6
2329	10	Rf	2	1.333	1.851	0.540	6
2330	11	Dk 2	1	0.500	2.489	0.402	7
2331	12	Os	1	0.333	2.106	0.475	0
2332	H 10	TMK3	—	—	—	—	—
2333	1	Zr	2	1.250	1.015	0.985	1
2334	2	Tg	4	2.833	0.435	2.299	2
2335	3	Ms	1	0.250	1.305	0.766	3
2336	4	Rf	3	2.250	0.725	1.379	3
2337	5	Bd	1	0.250	1.305	0.766	3
2338	6	Dk 1	1	0.333	1.595	0.627	4
2339	7	Dk 2	1	0.333	1.595	0.627	4
2340	8	Os	1	0.500	1.885	0.530	0
2341	H113	TMK4	—	—	—	—	—
2342	1	Zr	3	2.500	1.404	0.712	1
2343	2	Dk 1	1	0.333	2.042	0.490	2
2344	3	So	2	0.667	1.021	0.979	2
2345	4	Kg	3	1.333	0.766	1.306	3
2346	5	Rf 1	2	1.333	1.276	0.783	4
2347	6	Tg	3	1.667	0.893	1.119	4
2348	7	Dk 2	1	0.500	1.915	0.522	5
2349	8	Bd	1	0.333	1.532	0.653	5
2350	9	Rf 2	3	2.333	1.276	0.783	5
2351	10	Dk 3	1	0.333	1.915	0.522	6
2352	11	Dk 4	1	0.333	1.915	0.522	6
2353	12	Os	1	0.333	2.042	0.490	0

APPENDIX17(29):RRAMEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
2354	H118 TMK5		—	—	—	—	—
2355	1	Zr 1	2	1.000	1.442	0.694	1
2356	2	Zr 2	2	0.833	1.057	0.946	2
2357	3	Ts	3	1.700	0.769	1.301	3
2358	4	Tg	5	2.833	0.673	1.487	4
2359	5	Kc	1	0.333	1.345	0.743	4
2360	6	Rf 1	2	1.200	1.153	0.867	5
2361	7	Rf 2	2	1.200	1.153	0.867	5
2362	8	Rf 3	2	1.200	1.153	0.867	5
2363	9	Bd	1	0.200	1.249	0.800	5
2364	10	Dk 1	1	0.500	1.730	0.578	6
2365	11	Dk 2	1	0.500	1.730	0.578	6
2366	12	Dk 3	1	0.500	1.730	0.578	6
2367	13	Sg	1	0.500	2.499	0.400	1
2368	14	Os	2	1.500	1.922	0.520	0
2369	H126 BRW1		—	—	—	—	—
2370	1	Zr 1	2	1.333	1.333	0.750	1
2371	2	Zr 2	3	1.700	0.899	1.113	2
2372	3	Ts 1	5	2.417	0.589	1.698	3
2373	4	Sg	1	0.333	1.395	0.717	3
2374	5	Dk 1	1	0.200	1.085	0.922	4
2375	6	Bn	2	0.533	0.837	1.195	4
2376	7	Tg 1	4	2.033	0.806	1.241	4
2377	8	Tg 2	3	0.950	0.837	1.195	4
2378	9	Kw	3	2.000	1.147	0.872	5
2379	10	Kc	1	0.250	1.302	0.768	5
2380	11	Rf	2	1.250	1.240	0.807	5
2381	12	Ts 2	2	1.333	1.271	0.787	5
2382	13	Dk 2	2	1.333	1.581	0.633	6
2383	14	Dk 3	1	0.333	1.643	0.609	6
2384	15	Dk 4	1	0.500	1.736	0.576	6
2385	16	Bd 1	1	0.500	1.767	0.566	6
2386	17	Bd 2	1	0.500	2.076	0.482	7
2387	18	Os	1	0.500	1.829	0.547	0
2388	H55 BRW2		—	—	—	—	—
2389	1	Dl	3	2.500	1.954	0.512	1
2390	2	Kt	1	0.333	2.507	0.399	2
2391	3	Zr 1	2	0.833	1.572	0.636	2
2392	4	Zr 2	2	1.000	1.275	0.785	3
2393	5	Zr 3	2	0.833	1.062	0.942	4
2394	6	Ts	3	1.700	0.935	1.070	5
2395	7	Tg 1	5	3.667	0.977	1.023	6
2396	8	Sr	1	0.333	1.487	0.673	6
2397	9	Kc	1	0.200	1.529	0.654	7
2398	10	Bd	1	0.200	1.529	0.654	7
2399	11	Rf	3	2.200	1.359	0.736	7
2400	12	Tg 2	1	0.200	1.529	0.654	7
2401	13	Dk 1	1	0.333	1.912	0.523	8
2402	14	Dk 2	1	0.333	1.912	0.523	8
2403	15	Os	1	0.333	2.507	0.399	0
2404	H64 BRW3		—	—	—	—	—
2405	1	So 1	3	2.333	1.252	0.799	1
2406	2	Ts	3	1.583	0.873	1.146	2
2407	3	Sg 1	1	0.333	1.783	0.561	2
2408	4	Sg 2	1	0.333	1.404	0.712	3
2409	5	So 2	4	2.583	0.645	1.551	3
2410	6	Dk 1	1	0.250	1.176	0.850	4
2411	7	Dk 2	1	0.250	1.176	0.850	4
2412	8	Tg	4	2.000	0.645	1.551	4
2413	9	Ts 2	2	0.750	1.062	0.941	5
2414	10	Bd	1	0.250	1.176	0.850	5
2415	11	Rf	4	2.750	0.910	1.098	5
2416	12	Kc	2	1.000	1.404	0.712	6
2417	13	Dk 3	1	0.250	1.442	0.694	6
2418	14	Dk 4	2	0.750	1.328	0.753	6
2419	15	Dk 5	1	0.250	1.442	0.694	6
2420	16	Os	1	0.333	1.783	0.561	0
2422	H65 BRW4		—	—	—	—	—
2423	1	Zr 1	2	1.500	1.332	0.751	1
2424	2	Zr 2	2	0.750	0.888	1.126	2
2425	3	Ts	4	1.500	0.512	1.951	3
2426	4	Rf 1	3	2.250	0.888	1.126	4
2427	5	Tg	6	4.250	0.547	1.829	4
2428	6	Rf2	2	1.250	0.957	1.045	4
2429	7	Dk 1	1	0.333	1.401	0.714	5
2430	8	Dk 2	1	0.333	1.401	0.714	5
2431	9	Rf3	2	1.167	0.991	1.009	5
2432	10	Ms	1	0.167	1.059	0.944	5
2433	11	Bd	1	0.167	1.059	0.944	5
2434	12	Tk	1	0.167	1.059	0.944	5
2435	13	Rf4	2	1.167	0.991	1.009	5
2436	14	Dk 3	1	0.500	1.469	0.681	5
2437	15	Dk 4	1	0.500	1.503	0.665	6
2438	16	Dk 5	1	0.500	1.503	0.665	6
2439	17	Os	1	0.500	1.845	0.542	0
2440	H105 BRW5		—	—	—	—	—
2441	1	Zr 1	2	1.500	1.466	0.682	1
2442	2	Zr 2	2	0.750	0.902	1.109	2
2443	3	Tg 1	4	2.500	0.564	1.774	3
2444	4	Kc	1	0.250	1.353	0.739	4
2445	5	Rf	2	1.250	1.127	0.887	4
2446	6	Tg 2	2	1.250	1.127	0.887	4
2447	7	Dk 1	1	0.500	1.916	0.522	5
2448	8	Bd	1	0.500	1.916	0.522	5
2449	9	Os	1	0.500	2.255	0.444	0

APPENDIX17(30):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2450	H160	DIS-1	—	—	—	—	—
2451	1	Zr 1	4	1.900	1.299	0.770	1
2452	2	Sg 1	2	0.450	1.364	0.733	1
2453	3	Sr 1	2	0.400	1.176	0.850	1
2454	4	Zr 2	2	0.533	1.266	0.790	1
2455	5	Dk 1	1	0.250	1.540	0.649	2
2456	6	Kg 1	5	3.750	1.374	0.728	2
2457	7	Kg 2	5	3.333	1.151	0.869	2
2458	8	Zr 3	3	1.333	1.296	0.771	2
2459	9	Zr 4	2	0.533	1.294	0.773	3
2460	10	Dk 2	1	0.200	1.615	0.619	3
2461	11	Bd 1	1	0.200	1.615	0.619	3
2462	12	Dk 3	1	0.200	1.615	0.619	3
2463	13	Zr 5	2	0.700	1.076	0.930	3
2464	14	Dk 4	1	0.200	1.392	0.719	3
2465	15	Kf	1	0.200	1.392	0.719	3
2466	16	Zr 6	3	0.783	1.342	0.745	3
2467	17	Kg 3	3	1.833	1.216	0.822	3
2468	18	Bn 1	2	1.333	1.532	0.653	3
2469	19	Tg 1	3	1.667	1.209	0.827	4
2470	20	Zr 7	2	0.750	0.991	1.010	4
2471	21	Zr 8	3	1.667	1.562	0.640	4
2472	22	Tg 2	4	2.833	1.562	0.640	4
2473	23	Bd 2	1	0.333	1.457	0.686	4
2474	24	Zr 9	2	0.444	1.131	0.884	4
2475	25	Dk 5	1	0.500	1.773	0.564	4
2476	26	Tg 3	6	3.667	1.118	0.894	5
2477	27	Bd 3	1	0.333	1.449	0.690	5
2478	28	Ts 1	4	1.833	0.895	1.117	5
2479	29	Sr 2	3	2.333	1.793	0.558	5
2480	30	Dk 6	1	0.333	1.803	0.555	5
2481	31	Rf 1	2	1.250	1.798	0.556	5
2482	32	Dk 7	1	0.250	1.803	0.555	5
2483	33	Rf 2	1	0.250	1.803	0.555	5
2484	34	Tg 4	9	6.083	1.041	0.961	5
2485	35	Kc 1	1	0.167	1.359	0.736	6
2486	36	Dk 8	1	0.167	1.359	0.736	6
2487	37	Rf 3	2	1.167	1.354	0.738	6
2488	38	Rf 4	2	1.167	1.354	0.738	6
2489	39	Ts 2	3	1.278	0.978	1.023	6
2490	40	Kg 4	3	0.861	0.855	1.169	6
2491	41	Zr 10	2	0.375	1.091	0.917	6
2492	42	Zr 11	2	0.450	1.106	0.904	6
2493	43	Bd 4	1	0.333	2.034	0.492	6
2494	44	Kc 2	1	0.333	2.034	0.492	6
2495	45	Dk 9	1	0.500	2.039	0.491	6
2496	46	Ts 3	2	0.222	0.945	1.058	6
2497	47	Bn 2	4	2.611	1.261	0.793	6
2498	48	St 2	1	0.111	1.281	0.780	6
2499	49	Dk 10	1	0.111	1.281	0.780	6
2500	50	Kc 3	1	0.111	1.281	0.780	6
2501	51	Rf 5	2	1.111	1.276	0.783	6
2502	52	Bn 3	3	1.444	1.261	0.793	6
2503	53	Bd 5	1	0.111	1.281	0.780	6
2504	54	Dk 11	1	0.500	1.595	0.627	7
2505	55	Dk 12	1	0.500	1.595	0.627	7
2506	56	St 3	1	0.333	1.219	0.821	7
2507	57	Tg 5	9	6.167	0.838	1.194	7
2508	58	Zr 12	2	0.583	1.066	0.938	7
2509	59	Zr 13	8	7.000	1.291	0.774	7
2510	60	Tg 6	5	4.000	1.322	0.757	7
2511	61	St 4	1	0.250	1.502	0.666	7
2512	62	Bd 6	1	0.250	1.502	0.666	7
2513	63	Rf 6	2	1.250	1.497	0.668	7
2514	64	Dk 13	1	0.500	1.517	0.659	7
2515	65	Dk 14	1	0.333	1.502	0.666	7
2516	66	Rf 7	3	2.333	1.492	0.670	7
2517	67	Dk 15	1	0.111	1.078	0.927	8
2518	68	Rf 8	1	0.111	1.078	0.927	8
2519	69	Bd 7	2	1.111	1.073	0.932	8
2520	70	Kc 4	1	0.111	1.078	0.927	8
2521	71	Dk 16	1	0.111	1.078	0.927	8
2522	72	Rf 9	2	1.111	1.073	0.932	8
2523	73	Tg 7	4	2.500	1.281	0.780	8
2524	74	Dk 17	1	0.125	1.532	0.653	8
2525	75	Rf 10	2	1.125	1.527	0.655	8
2526	76	Dk 18	1	0.125	1.532	0.653	8
2527	77	Bd 8	1	0.125	1.532	0.653	8
2528	78	Bd 9	1	0.125	1.532	0.653	8
2529	79	Dk 19	1	0.125	1.532	0.653	8
2530	80	Dk 20	1	0.125	1.532	0.653	8
2531	81	Rf 11	2	1.200	1.557	0.642	8
2532	82	Dk 21	1	0.200	1.562	0.640	8
2533	83	Dk 22	1	0.200	1.562	0.640	8
2534	84	Bd 10	1	0.200	1.562	0.640	8
2535	85	Dk 23	1	0.500	1.738	0.575	8
2536	86	Bd 11	1	0.333	1.733	0.577	8
2537	87	Dk 24	1	0.333	1.733	0.577	8
2538	88	Dk 25	1	0.500	1.314	0.761	9
2539	89	Dk 26	1	0.500	1.314	0.761	9
2540	90	Bd 12	1	0.250	1.522	0.657	9
2541	91	Rf 12	2	1.250	1.517	0.659	9
2542	92	Rf 13	2	1.250	1.517	0.659	9
2543	93	Dk 27	1	0.500	1.768	0.566	9
2544	94	Dk 28	1	0.500	1.798	0.556	9
2545	95	Dk 29	1	0.500	1.758	0.569	10
2546	96	Dk 30	1	0.500	1.758	0.569	10
2547	97	Sg 2	1	0.200	1.432	0.698	1
2548	98	Os	5	2.750	1.191	0.840	0

APPENDIX17(31):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2549	H75 DIS-2		–	–	–	–	–
2550	1	Zr 1	3	1.833	0.987	1.013	1
2551	2	Zr 2	2	0.833	1.299	0.770	2
2552	3	Zr 3	3	1.476	0.779	1.283	2
2553	4	Bn 1	2	1.000	1.663	0.601	3
2554	5	Dk 1	1	0.333	1.247	0.802	3
2555	6	Tg	7	4.833	0.675	1.480	3
2556	7	Rf 1	2	1.500	2.078	0.481	4
2557	8	Dk 2	1	0.143	1.143	0.875	4
2558	9	Bn 2	2	0.643	0.987	1.013	4
2559	10	Rf 2	2	1.143	1.091	0.916	4
2560	11	Bn 3	2	1.143	1.091	0.916	4
2561	12	Dk 3	1	0.143	1.143	0.875	4
2562	13	Bd	1	0.143	1.143	0.875	4
2563	14	Dk 4	1	0.500	2.546	0.393	5
2564	15	Kw	2	1.000	1.351	0.740	5
2565	16	Dk 5	1	0.500	1.559	0.642	5
2566	17	Dk 6	1	0.500	1.559	0.642	5
2567	18	Rf 3	2	1.500	1.767	0.566	6
2568	19	Dk 7	1	0.500	2.234	0.448	7
2569	20	Os	1	0.333	1.455	0.687	0
2570	H157 DIS-3		–	–	–	–	–
2571	1	Zr 1	2	0.367	0.800	1.250	1
2572	2	Kg 1	5	1.750	0.706	1.416	2
2573	3	Tg 1	3	1.700	0.987	1.013	3
2574	4	Kg 2	4	1.533	0.800	1.250	3
2575	5	Tg 2	3	2.200	1.004	0.996	3
2576	6	Tg 3	3	2.200	1.004	0.996	3
2577	7	Ms 1	1	0.333	1.319	0.758	4
2578	8	Rf 1	2	1.333	1.302	0.768	4
2579	9	Zr 2	2	0.583	1.064	0.940	4
2580	10	Tg 4	3	2.250	1.098	0.911	4
2581	11	Zr 3	2	0.500	1.047	0.955	4
2582	12	Dk 1	1	0.333	1.336	0.748	4
2583	13	Bd 1	1	0.333	1.336	0.748	4
2584	14	Dk 2	1	0.333	1.336	0.748	4
2585	15	Bd 2	1	0.333	1.336	0.748	4
2586	16	Dk 3	1	0.500	1.634	0.612	5
2587	17	Tg 5	3	2.000	1.345	0.744	5
2588	18	Dk 4	1	0.333	1.430	0.699	5
2589	19	Ms 2	1	0.333	1.430	0.699	5
2590	20	Tg 6	4	3.000	1.311	0.763	5
2591	21	Rf 2	2	1.333	1.660	0.603	6
2592	22	Bd 3	1	0.333	1.677	0.596	6
2593	23	Dk 5	1	0.250	1.643	0.609	6
2594	24	Rf 3	2	1.250	1.626	0.615	6
2595	25	Bd 4	1	0.250	1.643	0.609	6
2596	26	Dk 6	1	0.500	1.992	0.502	7
2597	27	Dk 7	1	0.500	1.958	0.511	7
2598	28	Sg 1	1	0.167	1.243	0.805	1
2599	29	Zr 4	2	0.417	1.174	0.851	1
2600	30	Tg 7	4	3.500	1.455	0.687	2
2601	31	Bd 5	1	0.250	1.787	0.560	3
2602	32	Dk 8	1	0.250	1.787	0.560	3
2603	33	Sr	1	0.250	1.787	0.560	3
2604	34	Sg 2	1	0.167	1.243	0.805	1
2605	35	Sg 3	1	0.167	1.243	0.805	1
2606	36	Zr 5	2	0.417	1.174	0.851	1
2607	37	Tg 8	4	3.500	1.455	0.687	2
2608	38	Dk 9	1	0.250	1.787	0.560	3
2609	39	Bd 6	1	0.250	1.787	0.560	3
2610	40	Kc	1	0.250	1.787	0.560	3
2611	41	Os	6	4.500	0.911	1.098	0
2612	H66 DIS-4		–	–	–	–	–
2613	1	Zr 1	2	1.500	1.981	0.505	1
2614	2	Zr 2	2	0.833	1.537	0.650	2
2615	3	Kg	3	2.000	1.162	0.861	3
2616	4	Tr	1	0.333	1.674	0.597	4
2617	5	Zr 3	2	0.583	0.922	1.084	4
2618	6	Ts 1	4	2.250	0.752	1.331	5
2619	7	Dk 1	1	0.250	1.264	0.791	6
2620	8	Rf 1	2	1.250	1.196	0.836	6
2621	9	Tg	4	2.083	0.854	1.171	6
2622	10	Dk 2	1	0.500	1.708	0.585	7
2623	11	Rf 2	2	1.250	1.298	0.770	7
2624	12	Ts 2	3	2.250	1.230	0.813	7
2625	13	Kc	1	0.250	1.367	0.732	7
2626	14	Dk 3	1	0.500	1.811	0.552	8
2627	15	Bd	1	0.333	1.742	0.574	8
2628	16	Ms	1	0.333	1.742	0.574	8
2629	17	Os	1	0.500	2.494	0.401	0
2630	H 23 DIS-5		–	–	–	–	–
2631	1	Zr 1	2	1.500	1.636	0.611	1
2632	2	Zr 2	2	1.000	1.091	0.917	2
2633	3	Zr 3	2	0.667	0.727	1.375	3
2634	4	Tg	6	5.500	0.545	1.833	4
2635	5	Dk 1	1	0.167	1.273	0.786	5
2636	6	Dk 2	1	0.167	1.273	0.786	5
2637	7	Dk 3	1	0.167	1.273	0.786	5
2638	8	Bd	1	0.167	1.273	0.786	5
2639	9	Kc	1	0.167	1.273	0.786	5
2640	10	Os	1	0.500	2.364	0.423	0

APPENDIX17(32):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2641	H150	JNG-1	—	—	—	—	—
2642	1	Zr 1	2	0.667	0.999	1.001	1
2643	2	Zr 2	3	1.033	0.703	1.422	2
2644	3	Ts 1	3	1.167	0.950	1.053	3
2645	4	Ts 2	5	1.667	0.580	1.725	3
2646	5	Rf 1	2	1.333	1.295	0.772	4
2647	6	Tg 1	3	2.333	1.270	0.787	4
2648	7	Tg 2	4	3.200	0.876	1.142	4
2649	8	Tg 3	3	1.700	0.876	1.142	4
2650	9	Zr 3	2	0.450	0.826	1.210	4
2651	10	Tg 4	4	2.533	0.826	1.210	4
2652	11	Dk 1	1	0.500	1.665	0.601	5
2653	12	Kc 1	1	0.333	1.640	0.610	5
2654	13	Bd 1	1	0.333	1.640	0.610	5
2655	14	Dk 2	1	0.250	1.246	0.803	5
2656	15	Kc 2	1	0.250	1.246	0.803	5
2657	16	Bd 2	1	0.250	1.246	0.803	5
2658	17	Rf 2	2	1.333	1.221	0.819	5
2659	18	Bd 3	1	0.333	1.246	0.803	5
2660	19	Tg 5	4	3.000	1.098	0.911	5
2661	20	Bd 4	1	0.250	1.196	0.836	5
2662	21	Kc 3	1	0.250	1.196	0.836	5
2663	22	Rf 3	3	2.250	1.147	0.872	5
2664	23	Dk 3	1	0.500	1.591	0.629	6
2665	24	Rf 4	2	1.250	1.443	0.693	6
2666	25	Kc 4	1	0.250	1.468	0.681	6
2667	26	Bd 5	1	0.250	1.468	0.681	6
2668	27	Dk 4	1	0.333	1.517	0.659	6
2669	28	Dk 5	1	0.333	1.517	0.659	6
2670	29	Dk 6	1	0.500	1.813	0.552	7
2671	30	Sg 1	1	0.333	1.690	0.592	1
2672	31	Sg 2	1	0.333	1.690	0.592	1
2673	32	Os	3	2.500	1.320	0.758	0
2674	H93	JNG-2	—	—	—	—	—
2675	1	Zr 1	2	0.700	1.783	0.561	1
2676	2	Sg	2	0.700	1.783	0.561	1
2677	3	Kg	5	3.500	1.358	0.736	2
2678	4	Bd 1	1	0.200	1.839	0.544	3
2679	5	Zr 2	2	0.700	1.160	0.862	3
2680	6	Dk 1	1	0.200	1.839	0.544	3
2681	7	So	2	0.833	1.019	0.982	4
2682	8	Tg 1	3	1.333	0.934	1.071	5
2683	9	Tg 2	3	1.667	1.188	0.841	6
2684	10	Bn	2	0.667	1.188	0.841	6
2685	11	Rf 1	3	2.333	1.556	0.643	7
2686	12	Kc	1	0.333	1.669	0.599	7
2687	13	Rf 2	3	2.000	1.500	0.667	7
2688	14	Dk 2	1	0.333	2.037	0.491	8
2689	15	Dk 3	1	0.333	2.037	0.491	8
2690	16	Bd 2	1	0.333	1.981	0.505	8
2691	17	Dk 4	2	1.333	1.924	0.520	8
2692	18	Dk 5	1	0.500	2.405	0.416	9
2693	19	Os	2	1.000	2.207	0.453	0
2694	H149	JNG-3	—	—	—	—	—
2695	1	Kd	2	1.500	1.395	0.717	1
2696	2	Zr 1	2	0.667	1.021	0.980	2
2697	3	Tg 1	6	3.500	0.680	1.470	3
2698	4	So 1	3	1.500	0.783	1.278	4
2699	5	Rf 1	3	2.167	1.021	0.980	4
2700	6	Dk 1	1	0.167	1.089	0.918	4
2701	7	Dk 2	1	0.167	1.089	0.918	4
2702	8	So 2	3	1.500	0.885	1.130	4
2703	9	Ts	3	1.167	0.953	1.050	5
2704	10	Dk 3	1	0.333	1.191	0.840	5
2705	11	Dk 4	1	0.333	1.429	0.700	5
2706	12	Dk 5	1	0.333	1.429	0.700	5
2707	13	Dk 6	1	0.333	1.293	0.773	5
2708	14	Tg 2	3	1.667	1.157	0.864	5
2709	15	Tg 3	3	1.667	1.225	0.816	6
2710	16	Rf 2	2	1.333	1.327	0.754	6
2711	17	Rf 3	3	2.333	1.497	0.668	6
2712	18	Bd 1	1	0.333	1.565	0.639	6
2713	19	Bd 2	1	0.333	1.633	0.612	7
2714	20	Rf 4	3	2.333	1.565	0.639	7
2715	21	Dk 7	1	0.500	1.735	0.576	7
2716	22	Dk 8	1	0.333	1.905	0.525	7
2717	23	Dk 9	1	0.333	1.905	0.525	7
2718	24	Dk 10	1	0.333	1.973	0.507	8
2719	25	Dk 11	1	0.333	1.973	0.507	8
2720	26	Os	1	0.500	1.803	0.555	0

APPENDIX17(33):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2721	H154 JNG-4		—	—	—	—	—
2722	1	Zr	2	1.250	1.224	0.817	1
2723	2	Ts	4	2.833	0.883	1.133	2
2724	3	Bd 1	1	0.250	1.248	0.802	3
2725	4	Kg	3	0.708	0.612	1.634	3
2726	5	Kc 1	1	0.250	1.248	0.802	3
2727	6	Tg1	8	4.283	0.435	2.296	4
2728	7	Rf 1	3	2.333	0.930	1.076	4
2729	8	Kc 2	1	0.125	0.800	1.249	5
2730	9	Bd 2	1	0.125	0.800	1.249	5
2731	10	Tg 2	5	3.125	0.659	1.517	5
2732	11	Tg 3	4	2.625	0.706	1.416	5
2733	12	Tg 4	2	0.625	0.753	1.328	5
2734	13	Rf 2	2	1.125	0.777	1.287	5
2735	14	Rf 3	2	0.458	0.730	1.370	5
2736	15	Dk 1	1	0.333	1.295	0.772	5
2737	16	Dk 2	1	0.333	1.295	0.772	5
2738	17	Rf 4	2	1.200	1.000	1.000	6
2739	18	Rf 5	2	1.200	1.000	1.000	6
2740	19	Kc 3	1	0.200	1.024	0.977	6
2741	20	Bd 3	1	0.200	1.024	0.977	6
2742	21	Rf 6	2	1.250	1.047	0.955	6
2743	22	Kc 4	1	0.250	1.071	0.934	6
2744	23	Bd 4	1	0.250	1.071	0.934	6
2745	24	Rf 7	2	1.500	1.095	0.914	6
2746	25	Dk 3	1	0.500	1.142	0.876	6
2747	26	Dk 4	3	2.500	1.047	0.955	6
2748	27	Dk 5	1	0.500	1.365	0.732	7
2749	28	Dk 6	1	0.500	1.365	0.732	7
2750	29	Dk 7	1	0.500	1.412	0.708	7
2751	30	Dk 8	1	0.500	1.459	0.685	7
2752	31	Dk 9	1	0.333	1.412	0.708	7
2753	32	Dk 10	1	0.333	1.412	0.708	7
2754	33	Os	1	0.500	1.589	0.629	0
2755	H138 JNG-5		—	—	—	—	—
2756	1	Zr 1	2	1.500	1.593	0.628	1
2757	2	Zr 2	2	0.833	1.138	0.879	2
2758	3	Zr 3	3	1.250	0.759	1.318	3
2759	4	Tg	4	2.583	0.835	1.198	4
2760	5	Bn	2	0.667	0.986	1.014	4
2761	6	Rf 1	4	3.250	1.138	0.879	5
2762	7	Kc	1	0.250	1.366	0.732	5
2763	8	Bd 1	1	0.250	1.366	0.732	5
2764	9	Rf 2	3	2.000	1.290	0.775	5
2765	10	Dk 1	1	0.250	1.669	0.599	6
2766	11	Dk 2	1	0.250	1.669	0.599	6
2767	12	Dk 3	1	0.250	1.669	0.599	6
2768	13	Dk 4	1	0.333	1.821	0.549	6
2769	14	Dk 5	2	1.333	1.745	0.573	6
2770	15	Bd 2	1	0.500	2.276	0.439	7
2771	16	Os	1	0.500	2.124	0.471	0
2772	H132 LMK1		—	—	—	—	—
2773	1	Zr	2	0.833	1.240	0.807	1
2774	2	Sg	2	0.833	1.240	0.807	1
2775	3	Kg 1	3	1.333	0.806	1.241	2
2776	4	Kg 2	3	0.676	0.496	2.017	3
2777	5	Tg 1	7	6.333	0.620	1.613	4
2778	6	Tg 2	5	3.833	0.682	1.467	4
2779	7	Bd 1	1	0.143	1.116	0.896	5
2780	8	Dk 1	1	0.143	1.116	0.896	5
2781	9	Dk 2	1	0.143	1.116	0.896	5
2782	10	Dk 3	1	0.143	1.116	0.896	5
2783	11	Dk 4	1	0.143	1.116	0.896	5
2784	12	Dk 5	1	0.143	1.116	0.896	5
2785	13	Bd 2	1	0.200	1.178	0.849	5
2786	14	Kc	1	0.200	1.178	0.849	5
2787	15	Tg 3	2	1.200	1.116	0.896	5
2788	16	Dk 6	1	0.200	1.178	0.849	5
2789	17	Dk 7	1	0.500	1.612	0.621	6
2790	18	Os	2	1.000	1.674	0.598	0
2791	H 68 LMK2		—	—	—	—	—
2792	1	Zr 1	2	1.333	1.116	0.896	1
2793	2	Zr 2	3	1.033	0.682	1.467	2
2794	3	Bn	3	1.833	0.930	1.076	3
2795	4	Tg	5	2.500	0.620	1.613	3
2796	5	Rf 1	2	0.833	1.302	0.768	4
2797	6	Dk 1	1	0.333	1.426	0.701	4
2798	7	Ts	3	2.200	0.992	1.008	4
2799	8	Rf 2	2	1.200	1.054	0.949	4
2800	9	Rf 3	3	2.200	0.992	1.008	4
2801	10	Dk 2	1	0.200	1.116	0.896	4
2802	11	Dk 3	2	1.500	1.736	0.576	5
2803	12	Bd	1	0.333	1.488	0.672	5
2804	13	Kc	1	0.333	1.488	0.672	5
2805	14	Dk 4	1	0.500	1.550	0.645	5
2806	15	Dk 5	1	0.333	1.488	0.672	5
2807	16	Dk 6	1	0.333	1.488	0.672	5
2808	17	Dk 7	1	0.500	2.231	0.448	6
2809	18	Os	1	0.500	1.612	0.621	0

APPENDIX17(34):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
2810	H 79 LMK3		—	—	—	—	—
2811	1	Fr	2	1.500	1.711	0.584	1
2812	2	Zr 1	2	0.833	1.311	0.763	2
2813	3	So	3	1.333	0.956	1.047	3
2814	4	Zr 2	2	0.476	0.778	1.286	4
2815	5	Bn 1	3	2.333	1.311	0.763	4
2816	6	Tg	7	4.500	0.644	1.552	5
2817	7	St	1	0.333	1.756	0.570	5
2818	8	Dk 1	1	0.333	1.756	0.570	5
2819	9	Bn 2	2	0.643	0.956	1.047	6
2820	10	Rf 1	2	1.143	1.044	0.957	6
2821	11	Dk 2	1	0.143	1.089	0.918	6
2822	12	Kc	1	0.143	1.089	0.918	6
2823	13	Ts	2	1.143	1.044	0.957	6
2824	14	Bn 3	2	0.643	1.000	1.000	6
2825	15	Kw 1	2	1.000	1.311	0.763	7
2826	16	Dk 3	1	0.500	1.489	0.672	7
2827	17	Bd	1	0.500	1.489	0.672	7
2828	18	Kw 2	2	1.500	1.400	0.714	7
2829	19	Rf 2	2	1.500	1.711	0.584	8
2830	20	Dk 4	1	0.500	1.844	0.542	8
2831	21	Dk 5	1	0.500	2.155	0.464	9
2832	22	Os	1	0.500	2.155	0.464	0
2833	H107 LMK4		—	—	—	—	—
2834	1	Zr 1	2	1.500	1.364	0.733	1
2835	2	Zr 2	2	0.700	0.818	1.222	2
2836	3	Tg	5	3.833	0.455	2.200	3
2837	4	Kc	1	0.200	1.182	0.846	4
2838	5	Rf	3	2.200	0.818	1.222	4
2839	6	Dk 1	1	0.200	1.182	0.846	4
2840	7	Bd	1	0.200	1.182	0.846	4
2841	8	Dk 2	1	0.333	1.545	0.647	5
2842	9	Dk 3	1	0.333	1.545	0.647	5
2843	10	Os	1	0.500	2.091	0.478	0
2844	H 57 LMK5		—	—	—	—	—
2845	1	Zr 1	2	1.500	1.529	0.654	1
2846	2	Zr 2	2	0.833	1.062	0.942	2
2847	3	Zr 3	3	1.083	0.680	1.471	3
2848	4	Ts	4	2.083	0.637	1.569	4
2849	5	Tg 1	3	2.333	1.062	0.942	4
2850	6	Rf 1	2	1.250	1.105	0.905	5
2851	7	Dk 1	1	0.250	1.190	0.841	5
2852	8	Tg 2	4	3.250	0.935	1.070	5
2853	9	Dk 2	1	0.333	1.614	0.619	5
2854	10	Bd 1	1	0.333	1.614	0.619	5
2855	11	Dk 3	1	0.500	1.657	0.604	6
2856	12	Bd 2	1	0.250	1.487	0.673	6
2857	13	Kc	1	0.250	1.487	0.673	6
2858	14	Rf 2	1	0.250	1.487	0.673	6
2859	15	Os	1	0.500	2.082	0.480	0
2860	H 77 SMN1		—	—	—	—	—
2861	1	Zr1	2	0.833	1.343	0.745	1
2862	2	Zr2	3	1.833	0.983	1.017	2
2863	3	St	1	0.333	1.438	0.695	3
2864	4	Kg	3	1.476	0.719	1.390	3
2865	5	Dk1	1	0.333	1.175	0.851	4
2866	6	Tg	7	4.667	0.551	1.814	4
2867	7	Bn	3	0.976	0.767	1.303	5
2868	8	Bd1	1	0.143	1.007	0.993	5
2869	9	Rf1	2	1.143	0.959	1.043	5
2870	10	Dk2	1	0.143	1.007	0.993	5
2871	11	Rf2	2	1.143	0.959	1.043	5
2872	12	Bd2	1	0.143	1.007	0.993	5
2873	13	Rf3	3	2.333	1.127	0.887	6
2874	14	Rf4	2	1.333	1.175	0.851	6
2875	15	Dk2	1	0.500	1.414	0.707	6
2876	16	Dk4	1	0.500	1.414	0.707	6
2877	17	Dk5	1	0.333	1.582	0.632	7
2878	18	Dk6	1	0.333	1.582	0.632	7
2879	19	Dk7	1	0.500	1.630	0.613	7
2880	20	Sg	1	0.500	2.206	0.453	1
2881	21	Os	2	1.500	1.750	0.571	1
2882	H47 SMN2		—	—	—	—	—
2883	1	Zr	2	1.333	1.100	0.909	1
2884	2	Kg	3	1.643	0.605	1.653	2
2885	3	Tg	7	5.667	0.330	3.031	3
2886	4	Dk 1	1	0.333	1.210	0.827	3
2887	5	Bd	1	0.143	0.935	1.070	4
2888	6	Wk	1	0.143	0.935	1.070	4
2889	7	Kc	1	0.143	0.935	1.070	4
2890	8	St	1	0.143	0.935	1.070	4
2891	9	Dk 2	1	0.143	0.935	1.070	4
2892	10	Rf	3	2.143	0.715	1.399	4
2893	11	Dk 3	1	0.333	1.320	0.758	5
2894	12	Dk 4	1	0.333	1.320	0.758	5
2895	13	Os	1	0.500	1.705	0.587	0

APPENDIX17(35):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Designation	Conn.	Contr.	RRA	1/X RRA	Depth
2896	H 86 SMN3		—	—	—	—	—
2897	1	Sg	2	0.667	0.754	1.327	1
2898	2	Zr 1	2	1.000	1.356	0.737	1
2899	3	Tg	6	4.833	0.377	2.654	2
2900	4	Zr 2	2	0.833	0.980	1.021	2
2901	5	Dk 1	1	0.167	1.055	0.948	3
2902	6	Dk 2	1	0.167	1.055	0.948	3
2903	7	Dk 3	1	0.167	1.055	0.948	3
2904	8	Bd	1	0.167	1.055	0.948	3
2905	9	Ts	3	1.667	0.603	1.659	3
2906	10	Kc	1	0.333	1.281	0.781	4
2907	11	Os	2	1.000	1.130	0.885	0
2908	H 69 SMN4		—	—	—	—	—
2909	1	Zr 1	2	1.500	1.674	0.598	1
2910	2	Zr 2	2	0.833	1.240	0.807	2
2911	3	Zr 3	3	1.500	0.868	1.152	3
2912	4	Kg	2	0.500	0.806	1.241	4
2913	5	Bn	2	0.667	1.178	0.849	4
2914	6	Tg	6	4.000	0.806	1.241	5
2915	7	Rf 1	3	2.500	1.550	0.645	5
2916	8	Rf 2	2	1.167	1.240	0.807	6
2917	9	Dk 1	1	0.167	1.302	0.768	6
2918	10	Rf 3	2	1.167	1.240	0.807	6
2919	11	Rf 4	2	1.167	1.240	0.807	6
2920	12	Bd	1	0.167	1.302	0.768	6
2921	13	Dk 2	1	0.333	2.045	0.489	6
2922	14	Dk 3	1	0.333	2.045	0.489	6
2923	15	Dk 4	1	0.500	1.736	0.576	7
2924	16	Dk 5	1	0.500	1.736	0.576	7
2925	17	Dk 6	1	0.500	1.736	0.576	7
2926	18	Os	1	0.500	2.169	0.461	0
2927	H 92 SMN5		—	—	—	—	—
2928	1	Sg	2	0.833	1.364	0.733	1
2929	2	Zr	3	1.250	0.899	1.113	1
2930	3	So	4	1.833	0.527	1.898	2
2931	4	Bn	3	1.750	0.837	1.195	3
2932	5	Bd 1	1	0.250	1.023	0.978	3
2933	6	Tg	6	3.750	0.527	1.898	3
2934	7	Rf 1	2	1.333	1.271	0.787	4
2935	8	Bd 2	1	0.333	1.333	0.750	4
2936	9	Bd 3	1	0.167	1.023	0.978	4
2937	10	Rf 2	2	1.167	0.961	1.041	4
2938	11	Rf 3	2	1.167	0.961	1.041	4
2939	12	Rf 4	2	1.167	0.961	1.041	4
2940	13	Kc	1	0.167	1.023	0.978	4
2941	14	Dk 1	1	0.500	1.767	0.566	5
2942	15	Dk 2	1	0.500	1.457	0.687	5
2943	16	Dk 3	1	0.500	1.457	0.687	5
2944	17	Dk 4	1	0.500	1.457	0.687	5
2945	18	Os	2	0.833	1.364	0.733	0
2946	H 42 WRR1		—	—	—	—	—
2947	1	Zr 1	2	1.500	1.595	0.627	1
2948	2	Zr 2	2	0.833	1.085	0.922	2
2949	3	Kg	3	1.700	0.702	1.424	3
2950	4	Tk	1	0.333	1.340	0.746	4
2951	5	Tg	5	3.667	0.574	1.741	4
2952	6	Dk 1	1	0.200	1.213	0.825	5
2953	7	Ms	1	0.200	1.213	0.825	5
2954	8	Kc	3	2.200	0.957	1.045	5
2955	9	Rf	1	0.200	1.213	0.825	5
2956	10	Dk 2	1	0.333	1.595	0.627	6
2957	11	Dk 3	1	0.333	1.595	0.627	6
2958	12	Os	1	0.500	2.234	0.448	0
2959	H123 WRR2		—	—	—	—	—
2960	1	Zr 1	2	1.000	1.252	0.799	1
2961	2	Zr 2	2	0.700	0.873	1.146	2
2962	3	Tg 1	5	2.667	0.569	1.757	3
2963	4	Bn	2	0.533	0.873	1.146	4
2964	5	Rf 1	3	2.200	0.948	1.054	4
2965	6	Tg 2	3	2.200	0.948	1.054	4
2966	7	Dk 1	1	0.200	1.100	0.909	4
2967	8	Rf 2	3	2.500	1.252	0.799	5
2968	9	Dk 2	1	0.333	1.480	0.676	5
2969	10	Dk 3	1	0.333	1.480	0.676	5
2970	11	Dk 4	1	0.333	1.480	0.676	5
2971	12	Bd	1	0.333	1.480	0.676	5
2972	13	Dk 5	1	0.333	1.783	0.561	6
2973	14	Dk 6	1	0.333	1.783	0.561	6
2974	15	Sg	1	0.500	2.238	0.447	1
2975	16	Os	2	1.500	1.707	0.586	0

APPENDIX17(36):RRA MEASURES (WITH EXTERIOR)

Serial	Space	Desig nation	Conn.	Contr.	RRA	1/X RRA	Depth
2976	H115	WRR3	—	—	—	—	—
2977	1	Zr 1	2	1.500	2.255	0.444	1
2978	2	Zr 2	2	1.000	1.760	0.568	2
2979	3	Kg	2	1.000	1.375	0.727	3
2980	4	Zr 3	2	1.000	1.100	0.909	4
2981	5	Zr 4	2	0.667	0.935	1.070	5
2982	6	Tg	6	5.000	0.880	1.137	6
2983	7	Sr	1	0.167	1.485	0.674	7
2984	8	Kc	1	0.167	1.485	0.674	7
2985	9	Bd	1	0.167	1.485	0.674	7
2986	10	Rf	2	1.167	1.375	0.727	7
2987	11	Dk 1	1	0.167	1.485	0.674	7
2988	12	Dk 2	1	0.500	1.980	0.505	8
2989	13	Os	1	0.500	2.859	0.350	0
2990	H43	WRR4	—	—	—	—	—
2991	1	Zr 1	4	3.500	1.340	0.746	1
2992	2	Sg 1	1	0.250	1.978	0.505	2
2993	3	Sg 2	1	0.250	1.978	0.505	2
2994	4	Zr 2	2	0.750	1.085	0.922	2
2995	5	Kc	2	0.833	0.957	1.045	3
2996	6	Tg	3	1.750	0.957	1.045	4
2997	7	Rf	4	3.333	1.213	0.825	5
2998	8	Bd	1	0.333	1.595	0.627	5
2999	9	Dk 1	1	0.250	1.851	0.540	6
3000	10	Dk 2	1	0.250	1.851	0.540	6
3001	11	Dk 3	1	0.250	1.851	0.540	6
3002	12	Os	1	0.250	1.978	0.505	0
3003	H151	WRR5	—	—	—	—	—
3004	1	Zr 1	3	1.500	1.387	0.721	1
3005	2	Sg	2	0.833	1.711	0.585	1
3006	3	Zr 2	2	0.833	1.089	0.918	2
3007	4	Zr 3	2	0.643	0.809	1.237	3
3008	5	Kg	7	3.000	0.545	1.836	4
3009	6	Ts 1	3	1.393	0.792	1.263	5
3010	7	Tg 1	3	2.143	0.843	1.187	5
3011	8	Kc 1	3	0.543	0.604	1.655	5
3012	9	Tg 2	2	0.643	0.843	1.187	5
3013	10	Bn 1	2	0.643	0.843	1.187	5
3014	11	Sr	2	0.643	0.843	1.187	5
3015	12	Rf 1	4	3.333	1.072	0.933	6
3016	13	Bd 1	1	0.333	1.123	0.890	6
3017	14	Dk 1	1	0.333	1.174	0.851	6
3018	15	Dk 2	1	0.333	1.174	0.851	6
3019	16	Tg 3	5	3.667	0.834	1.199	6
3020	17	Tg 4	5	3.000	0.800	1.250	6
3021	18	Rf 2	2	1.500	1.157	0.864	6
3022	19	Kw	2	1.500	1.157	0.864	6
3023	20	Rf 3	2	1.500	1.157	0.864	6
3024	21	Dk 3	1	0.250	1.404	0.712	7
3025	22	Dk 4	1	0.250	1.404	0.712	7
3026	23	Dk 5	1	0.250	1.404	0.712	7
3027	24	Dk 6	1	0.200	1.166	0.858	7
3028	25	Kc 2	1	0.200	1.166	0.858	7
3029	26	Rf 4	3	2.200	1.132	0.883	7
3030	27	Bd 2	1	0.200	1.166	0.858	7
3031	28	Bn 2	3	2.200	1.098	0.911	7
3032	29	Bd 3	1	0.200	1.132	0.883	7
3033	30	Rf 5	3	2.200	1.098	0.911	7
3034	31	Kc 3	1	0.200	1.132	0.883	7
3035	32	Dk 7	1	0.500	1.489	0.671	7
3036	33	Dk 8	1	0.500	1.489	0.671	7
3037	34	Dk 9	1	0.500	1.489	0.671	7
3038	35	Dk 10	1	0.333	1.464	0.683	8
3039	36	Dk 11	1	0.333	1.464	0.683	8
3040	37	Bd 4	1	0.333	1.430	0.699	8
3041	38	Dk 12	1	0.333	1.430	0.699	8
3042	39	Dk 13	1	0.333	1.430	0.699	8
3043	40	Dk 14	1	0.333	1.430	0.699	8
3044	41	Os	2	0.833	1.711	0.585	0

APPENDIX18(1):RRAMEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1	H35 ALF-1		—	—	—	—	—
2	1	Fj	1	0.500	1.809	0.553	1
3	2	Zr	2	1.333	1.130	0.885	2
4	3	So	3	1.083	0.603	1.659	3
5	4	Tg 1	3	1.833	0.829	1.206	4
6	5	Tg 2	4	3.333	0.829	1.206	4
7	6	Rf	2	1.333	1.356	0.737	5
8	7	Bd	1	0.333	1.507	0.664	5
9	8	Kc	1	0.250	1.507	0.664	5
10	9	Dk 1	1	0.250	1.507	0.664	5
11	10	Ms	1	0.250	1.507	0.664	5
12	11	Dk 2	1	0.500	2.035	0.492	6
14	H61 ALF-2		—	—	—	—	—
15	1	Zr	2	1.333	1.105	0.905	1
16	2	So	3	1.033	0.625	1.601	2
17	3	Dk 1	1	0.500	1.682	0.595	2
18	4	Bn	3	1.833	0.913	1.095	3
19	5	Tg	5	3.667	0.625	1.601	3
20	6	Bd 1	1	0.333	1.490	0.671	4
21	7	Fl 1	2	1.333	1.393	0.718	4
22	8	Bd 2	1	0.200	1.201	0.832	4
23	9	Kc	1	0.200	1.201	0.832	4
24	10	Fl 2	3	2.200	1.009	0.991	4
25	11	St	1	0.200	1.201	0.832	4
26	12	Dk 2	1	0.500	1.970	0.508	5
27	13	Dk 3	1	0.333	1.586	0.631	5
28	14	Dk 4	1	0.333	1.586	0.631	5
31	H100 ALF-3		—	—	—	—	—
32	1	Sg	1	0.333	1.378	0.726	1
33	2	So 1	1	0.500	2.399	0.417	1
34	3	So 2	3	1.643	0.970	1.031	2
35	4	So 3	2	1.500	1.990	0.502	2
36	5	Rf 1	7	5.167	0.731	1.367	3
37	6	Zr 1	2	0.833	1.276	0.784	3
38	7	Zr 2	2	1.000	1.616	0.619	3
39	8	Tg	3	2.143	1.072	0.933	4
40	9	Dk 1	1	0.143	1.140	0.877	4
41	10	Dk 2	1	0.143	1.140	0.877	4
42	11	Dk 3	1	0.143	1.140	0.877	4
43	12	St	1	0.143	1.140	0.877	4
44	13	Bn	2	0.393	0.766	1.306	4
45	14	Md	1	0.333	1.480	0.676	5
46	15	Bd 1	1	0.333	1.480	0.676	5
47	16	Fr	4	2.083	0.834	1.200	5
48	17	Fl	3	1.583	1.106	0.904	6
49	18	Dk 4	1	0.250	1.242	0.805	6
50	19	Ts 1	4	3.250	1.140	0.877	6
51	20	Dk 5	1	0.333	1.514	0.660	7
52	21	Ts 2	3	2.333	1.446	0.692	7
53	22	Wk	1	0.250	1.548	0.646	7
54	23	Dk 6	1	0.250	1.548	0.646	7
55	24	Dk 7	1	0.250	1.548	0.646	7
56	25	Bd 2	1	0.333	1.854	0.539	8
57	26	Mw	1	0.333	1.854	0.539	8
59	H82 ALF-4		—	—	—	—	—
60	1	Kg	3	1.500	1.510	0.662	1
61	2	Dk 1	2	1.333	1.903	0.526	2
62	3	Dk 2	2	1.333	1.903	0.526	2
63	4	Zr 1	2	0.833	1.241	0.806	2
64	5	Bd 1	1	0.500	2.337	0.428	3
65	6	Bd 2	1	0.500	2.337	0.428	3
66	7	Zr 2	2	0.667	1.013	0.987	3
67	8	Tg	6	4.333	0.827	1.209	4
68	9	St	1	0.167	1.261	0.793	5
69	10	Kc	1	0.167	1.261	0.793	5
70	11	Bn	2	0.500	0.931	1.075	5
71	12	Bd 3	1	0.167	1.261	0.793	5
72	13	Rf 1	3	2.167	1.179	0.848	5
73	14	Vr	3	1.250	1.075	0.930	6
74	15	Dk 3	1	0.333	1.613	0.620	6
75	16	Dk 4	1	0.333	1.613	0.620	6
76	17	Rf 2	2	0.833	1.427	0.701	7
77	18	Ts	4	3.333	1.386	0.722	7
78	19	Dk 5	2	1.500	1.820	0.549	8
79	20	Bd 4	1	0.250	1.820	0.549	8
80	21	Dk 6	1	0.250	1.820	0.549	8
81	22	Dk 7	1	0.250	1.820	0.549	8
82	23	Bd 5	1	0.500	2.254	0.444	9
84	H27 ALF-5		—	—	—	—	—
85	1	Zr 1	1	0.333	1.727	0.579	1
86	2	Zr 2	3	2.333	1.000	1.000	2
87	3	Dkl	1	0.333	1.727	0.579	3
88	4	Zr 3	3	1.167	0.636	1.571	4
89	5	Rf	2	1.333	1.182	0.846	4
90	6	Tg	3	1.833	0.818	1.222	4
91	7	Dk 2	1	0.500	1.909	0.524	5
92	8	Bd	2	1.333	1.364	0.733	5
93	9	Dk 3	1	0.333	1.545	0.647	6
94	10	Sr	1	0.500	2.091	0.478	0

APPENDIX18(2):RRAMEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
96	H63	ALF6	—	—	—	—	—
97	1	Zr 1	1	0.333	2.124	0.471	1
98	2	Zr 2	3	2.500	1.593	0.628	2
99	3	Zr 3	2	0.667	1.214	0.824	3
100	4	Dk 1	1	0.333	2.124	0.471	3
101	5	Zr 4	3	1.500	0.910	1.098	4
102	6	Bn	2	0.667	1.214	0.824	5
103	7	Zr 5	2	0.667	0.986	1.014	5
104	8	Rf 1	3	2.500	1.593	0.628	6
105	9	Tg	3	1.750	1.138	0.879	6
106	10	Dk 2	1	0.333	2.124	0.471	7
107	11	Dk 3	1	0.333	2.124	0.471	7
108	12	Rf 2	4	3.333	1.442	0.694	7
109	13	Ms	1	0.333	1.669	0.599	7
110	14	DK 4	1	0.250	1.973	0.507	8
111	15	Dk 5	1	0.250	1.973	0.507	8
112	16	Dk 6	1	0.250	1.973	0.507	8
114	H19	ALF7	—	—	—	—	—
115	1	Zr 1	1	0.500	1.916	0.522	1
116	2	Zr 2	2	1.250	1.127	0.887	2
117	3	Tg	4	2.500	0.564	1.774	3
118	4	Rf 1	2	0.750	0.902	1.109	4
119	5	Rf 2	2	1.250	1.127	0.887	4
120	6	Bd	1	0.250	1.353	0.739	4
121	7	Dk 1	2	1.500	1.466	0.682	5
122	8	Dk 2	1	0.500	1.916	0.522	5
123	9	Dk 3	1	0.500	2.255	0.444	6
125	H147	ALF8	—	—	—	—	—
126	1	Zr 1	1	0.500	1.378	0.726	5
127	2	Zr 2	2	1.125	0.933	1.071	4
128	3	Tg 1	8	4.833	0.533	1.875	1
129	4	Bn	2	0.625	0.844	1.184	3
130	5	Ts	2	0.625	0.756	1.324	2
131	6	Rf 1	2	1.125	0.933	1.071	4
132	7	Rf 2	3	2.125	0.889	1.125	4
133	8	Bd 1	1	0.125	0.978	1.023	4
134	9	Dk1	1	0.125	0.978	1.023	4
135	10	Rf 3	2	1.125	0.933	1.071	4
136	11	Rf 4	2	1.000	1.200	0.833	5
137	12	Zr 3	2	0.833	1.022	0.978	4
138	13	Dk 2	1	0.500	1.378	0.726	6
139	14	Dk 3	1	0.333	1.333	0.750	5
140	15	Dk 4	1	0.333	1.333	0.750	5
141	16	Dk 5	1	0.500	1.378	0.726	5
142	17	Dk 6	2	1.500	1.600	0.625	6
143	18	Tg 2	3	2.000	1.333	0.750	5
144	19	Dk 6	1	0.500	2.044	0.489	7
145	20	Bd 2	1	0.333	1.778	0.563	7
146	21	Rf 5	2	1.333	1.733	0.577	7
147	22	Dk 7	1	0.500	2.178	0.459	8
150	H24	SDK1	—	—	—	—	—
151	1	Zr 1	1	0.333	2.255	0.444	1
152	2	Zr 2	3	2.500	1.466	0.682	2
153	3	Dk 3	1	0.333	2.255	0.444	3
154	4	Kg	2	0.833	1.127	0.887	3
155	5	Zr 3	2	0.833	1.015	0.986	4
156	6	Tg	3	2.000	1.127	0.887	5
157	7	Bd	1	0.333	1.916	0.522	6
158	8	Fl	2	1.333	1.691	0.591	6
159	9	Dk	1	0.500	2.480	0.403	7
161	H60	SDK2	—	—	—	—	—
162	1	Fj	1	0.500	2.210	0.452	1
163	2	Zr 1	2	1.500	1.634	0.612	2
164	3	Zr 2	2	1.000	1.153	0.867	3
165	4	Zr 3	2	0.667	0.769	1.301	4
166	5	Tg 1	6	3.833	0.481	2.081	5
167	6	Bd 1	1	0.167	1.057	0.946	6
168	7	Kc	1	0.167	1.057	0.946	6
169	8	Rf 1	2	1.167	0.961	1.041	6
170	9	Tg 2	2	1.167	0.961	1.041	6
171	10	Dk 1	3	2.167	0.865	1.156	6
172	11	Rf 2	1	0.500	1.538	0.650	7
173	12	Bd 2	1	0.500	1.538	0.650	7
174	13	Dk 2	1	0.333	1.442	0.694	7
175	14	Dk 3	1	0.333	1.442	0.694	7

APPENDIX 18(3):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr	RRA	1/X RRA	Depth
176	H85	SDK3	—	—	—	—	—
177	1	Kg 1	1	0.333	2.269	0.441	1
178	2	Zr 1	3	2.333	1.899	0.527	2
179	3	Zr 2	3	1.583	1.579	0.633	3
180	4	Dk 1	1	0.333	2.269	0.441	3
181	5	Dk 2	1	0.333	1.949	0.513	4
182	6	Ts 1	4	1.583	1.307	0.765	4
183	7	Bn	2	0.750	1.628	0.614	5
184	8	Zr 3	4	2.750	1.184	0.845	5
185	9	Tu 1	2	1.250	1.653	0.605	5
186	10	Kw	2	1.500	1.973	0.507	6
187	11	Dk 3	1	0.250	1.554	0.644	6
188	12	Zr 4	2	0.583	1.135	0.881	6
189	13	Dk 3	1	0.250	1.554	0.644	6
190	14	Bd 1	1	0.500	2.023	0.494	6
191	15	Dk 4	1	0.500	2.343	0.427	7
192	16	Kg 2	3	1.250	1.110	0.901	7
193	17	Zr 5	2	0.667	1.209	0.827	8
194	18	Tg 1	4	3.333	1.406	0.711	8
195	19	Sr	3	2.000	1.332	0.751	9
196	20	Dk 5	1	0.250	1.776	0.563	9
197	21	Dk 6	1	0.250	1.776	0.563	9
198	22	Bd 2	1	0.250	1.776	0.563	9
199	23	Md	1	0.333	1.702	0.588	10
200	24	Zr 6	2	0.583	1.505	0.665	10
201	25	So	4	1.833	1.702	0.588	11
202	26	Rf 1	2	1.250	2.047	0.488	12
203	27	Rf 2	2	1.250	2.047	0.488	12
204	28	Tg 2	3	2.250	2.023	0.494	12
205	29	Dk 7	1	0.500	2.417	0.414	13
206	30	Dk 8	1	0.500	2.417	0.414	13
207	31	Dk 9	1	0.333	2.393	0.418	13
208	32	Bd 3	1	0.333	2.393	0.418	13
209	H145	SDK4	—	—	—	—	—
210	1	So	1	0.500	1.705	0.587	1
211	2	Zr 1	2	1.200	1.209	0.827	2
212	3	Sm	5	3.250	0.775	1.291	3
213	4	Tg 1	4	3.200	1.085	0.922	4
214	5	Bd 1	1	0.200	1.271	0.787	4
215	6	Dk 1	1	0.200	1.271	0.787	4
216	7	Zr 2	2	0.700	0.775	1.291	4
217	8	Dk 2	1	0.250	1.581	0.633	5
218	9	Bd 2	1	0.250	1.581	0.633	5
219	10	Kj	1	0.250	1.581	0.633	5
220	11	Zr 3	2	0.643	0.837	1.195	5
221	12	Tg 2	7	6.500	0.961	1.041	6
222	13	Dk 3	1	0.143	1.457	0.687	7
223	14	Gk	1	0.143	1.457	0.687	7
224	15	Dk 4	1	0.143	1.457	0.687	7
225	16	Dk 5	1	0.143	1.457	0.687	7
226	17	Dk 6	1	0.143	1.457	0.687	7
227	18	Bd 3	1	0.143	1.457	0.687	7
228	H99	SDK5	—	—	—	—	—
229	1	Gr	1	0.167	1.468	0.681	1
230	2	Zr	1	0.167	1.468	0.681	1
231	3	Kg 1	2	1.500	1.406	0.711	1
232	4	Kg 2	6	5.333	1.034	0.967	2
233	5	Dk 1	1	0.500	1.841	0.543	2
234	6	Fkw	2	0.833	1.013	0.987	2
235	7	Bd 1	1	0.167	1.468	0.681	3
236	8	Dok 1	1	0.167	1.468	0.681	3
237	9	Dk 2	1	0.167	1.468	0.681	3
238	10	Kg 3	3	1.500	0.807	1.240	3
239	11	Ts 1	3	1.083	0.662	1.511	3
240	12	Dk 3	1	0.333	1.241	0.806	4
241	13	Ts 2	4	2.458	0.682	1.465	4
242	14	Tg	8	7.250	0.827	1.209	5
243	15	Dk 4	1	0.250	1.117	0.895	5
244	16	Dk 5	1	0.250	1.117	0.895	5
245	17	Dk 6	1	0.125	1.261	0.793	6
246	18	Dk 7	1	0.125	1.261	0.793	6
247	19	Bd 2	1	0.125	1.261	0.793	6
248	20	Dk 8	1	0.125	1.261	0.793	6
249	21	Dk9	1	0.125	1.261	0.793	6
250	22	Dok 2	1	0.125	1.261	0.793	6
251	23	Gk	1	0.125	1.261	0.793	6
252	H72	SDK6	—	—	—	—	—
253	1	Zr 1	1	0.500	2.448	0.408	1
254	2	Kg 1	2	1.500	1.952	0.512	2
255	3	Zr 2	2	1.000	1.519	0.658	3
256	4	Zr 3	2	0.833	1.147	0.872	4
257	5	Kg 2	3	1.333	0.837	1.195	5
258	6	Tg 1	2	1.333	1.271	0.787	6
259	7	Ts	3	1.476	0.713	1.403	6
260	8	Dk 1	1	0.500	1.767	0.566	7
261	9	Tg 2	7	5.667	0.713	1.403	7
262	10	Kj	1	0.333	1.209	0.827	7
263	11	Rf 1	3	2.143	1.085	0.922	8
264	12	Dk 2	1	0.143	1.209	0.827	8
265	13	Dk 3	1	0.143	1.209	0.827	8
266	14	Gk	1	0.143	1.209	0.827	8
267	15	Bd	1	0.143	1.209	0.827	8
268	16	Tg 3	1	0.143	1.302	0.768	8
269	17	Dk 4	1	0.333	1.669	0.599	9
270	18	Dk 5	1	0.333	1.669	0.599	9

APPENDIX 18(4):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
271	H129	SDK7	—	—	—	—	—
272	1	Zr 1	1	0.500	1.315	0.761	1
273	2	So 1	2	1.200	0.914	1.094	2
274	3	Kg 1	5	1.867	0.545	1.834	3
275	4	So 2	3	1.700	0.818	1.223	4
276	5	Tg 1	5	3.700	0.786	1.273	4
277	6	So 3	3	1.450	0.754	1.327	4
278	7	So 4	2	0.400	0.786	1.273	4
279	8	Bd 1	1	0.333	1.218	0.821	5
280	9	Tg 2	2	0.833	1.154	0.866	5
281	10	Dk 1	1	0.200	1.186	0.843	5
282	11	Gk	1	0.200	1.186	0.843	5
283	12	Bd 1	1	0.200	1.186	0.843	5
284	13	Rf 1	2	1.200	1.154	0.866	5
285	14	Sg	1	0.333	1.154	0.866	5
286	15	Tg 3	4	2.833	1.026	0.975	5
287	16	Tg 4	5	4.500	1.058	0.945	5
288	17	Rf 2	2	1.500	1.523	0.657	6
289	18	Dk 2	1	0.500	1.555	0.643	6
290	19	Bd 2	1	0.250	1.427	0.701	6
291	20	Rf 3	2	1.250	1.395	0.717	6
292	21	Dk 3	1	0.250	1.427	0.701	6
293	22	Dk 4	1	0.200	1.459	0.685	6
294	23	Dk 5	1	0.200	1.459	0.685	6
295	24	Dk 6	1	0.200	1.459	0.685	6
296	25	Bd 3	1	0.200	1.459	0.685	6
297	26	Dk 7	1	0.500	1.924	0.520	7
298	27	Dk 8	1	0.500	1.796	0.557	7
299	H5	SDK8	—	—	—	—	—
300	1	Zr 1	1	0.500	2.292	0.436	1
301	2	Md	2	1.333	1.146	0.873	2
302	3	Tg	3	2.000	0.573	1.745	3
303	4	Bd	1	0.333	1.719	0.582	4
304	5	Rf	2	1.333	1.146	0.873	4
305	6	Dk	1	0.500	2.292	0.436	4
306	H80	SHS1	—	—	—	—	—
307	1	Zr 1	1	0.500	2.230	0.449	1
308	2	Zr 2	2	1.500	1.774	0.564	2
309	3	Zr 3	2	0.833	1.367	0.732	3
310	4	Tg 1	3	1.700	1.007	0.993	4
311	5	Tg 2	5	2.583	0.743	1.346	5
312	6	Tk	1	0.333	1.462	0.684	5
313	7	Fl 1	2	1.200	1.151	0.869	6
314	8	Bn	2	0.533	0.863	1.159	6
315	9	Dg	1	0.200	1.199	0.834	6
316	10	Ts	4	3.200	1.055	0.948	6
317	11	Dk 1	1	0.500	1.606	0.623	7
318	12	Rf 1	3	2.000	1.031	0.970	7
319	13	St	1	0.250	1.510	0.662	7
320	14	Bd 1	1	0.250	1.510	0.662	7
321	15	Mw	1	0.250	1.510	0.662	7
322	16	Bd 2	1	0.333	1.486	0.673	8
323	17	Kw 1	2	0.583	1.295	0.772	8
324	18	Fl 2	4	3.500	1.606	0.623	9
325	19	Dk 2	1	0.250	2.062	0.485	10
326	20	Dk 3	1	0.250	2.062	0.485	10
327	21	Kw 2	1	0.250	2.062	0.485	10
328	H17	SHS2	—	—	—	—	—
329	1	Zr 1	1	0.500	2.030	0.493	1
330	2	Zr 2	2	1.333	1.160	0.862	2
331	3	Tg	3	1.200	0.580	1.724	3
332	4	Bd	2	0.533	0.870	1.149	4
333	5	Fl	5	3.833	0.435	2.299	4
334	6	Dk 1	1	0.200	1.305	0.766	5
335	7	Dk 2	1	0.200	1.305	0.766	5
336	8	Dk 3	1	0.200	1.305	0.766	5
337	H1	SHS3	—	—	—	—	—
338	1	Zr	1	0.500	2.292	0.436	1
339	2	So	2	1.333	1.146	0.873	2
340	3	Tg	3	2.000	0.573	1.745	3
341	4	Fl	2	1.333	1.146	0.873	4
342	5	Bd	1	0.333	1.719	0.582	4
343	6	Dk	1	0.500	2.292	0.436	5
344	H95	SHS4	—	—	—	—	—
345	1	Zr 1	2	1.000	1.443	0.693	1
346	2	Zr 2	2	0.833	1.358	0.736	2
347	3	Tr	2	0.750	1.132	0.884	2
348	4	So 1	3	1.250	0.962	1.039	3
349	5	So 2	4	1.667	0.736	1.359	3
350	6	Bn 1	2	0.833	1.330	0.752	4
351	7	So 3	2	0.583	0.877	1.140	4
352	8	Rf 1	3	1.750	1.047	0.955	4
353	9	Rf 2	2	1.500	1.754	0.570	5
354	10	Tg 1	3	1.750	1.075	0.930	5
355	11	Bn 2	2	1.333	1.471	0.680	5
356	12	Dk 1	1	0.333	1.528	0.654	5
357	13	Dk 2	1	0.500	2.235	0.447	6
358	14	Tg 2	4	3.333	1.387	0.721	6
359	15	Md	1	0.333	1.556	0.643	6
360	16	Dk 3	1	0.500	1.952	0.512	6
361	17	Bd	1	0.250	1.868	0.535	7
362	18	Dk 4	1	0.250	1.868	0.535	7
363	19	Dk 5	1	0.250	1.868	0.535	7

APPENDIX 18(5):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn	Contr.	RRA	1/X RRA	Depth
364	H81 SHS-5		—	—	—	—	—
365	1	Zr 1	1	0.500	2.667	0.375	1
366	2	Zr 2	2	1.500	2.222	0.450	2
367	3	Kg	2	1.000	1.822	0.549	3
368	4	So	2	1.000	1.467	0.682	4
369	5	Zr 3	2	0.833	1.156	0.865	5
370	6	Zr 4	3	1.250	0.889	1.125	6
371	7	Tg 1	4	2.533	1.022	0.978	7
372	8	Ts	2	0.667	1.022	0.978	7
373	9	Kc	1	0.250	1.467	0.682	8
374	10	Rf 1	5	4.250	1.289	0.776	8
375	11	Bd	1	0.250	1.467	0.682	8
376	12	Rf 2	3	1.833	1.200	0.833	8
377	13	Dk 1	1	0.200	1.733	0.577	9
378	14	Dk 2	1	0.200	1.733	0.577	9
379	15	Dk 3	1	0.200	1.733	0.577	9
380	16	DK 4	1	0.200	1.733	0.577	9
381	17	Dk 5	1	0.333	1.644	0.608	9
382	18	Bn	3	1.667	1.467	0.682	9
383	19	Dk 6	1	0.333	1.911	0.523	10
384	20	Rf 3	3	2.333	1.822	0.549	10
385	21	Dk 7	1	0.333	2.267	0.441	11
386	22	Dk 8	1	0.333	2.267	0.441	11
387	H54 UGN-1		—	—	—	—	—
388	1	So 1	1	0.500	2.035	0.492	1
389	2	Zr 1	2	1.500	1.430	0.699	2
390	3	So 2	2	0.667	0.935	1.070	3
391	4	Tg	6	5.000	0.550	1.819	4
392	5	Bd	1	0.167	1.155	0.866	5
393	6	Kc	1	0.167	1.155	0.866	5
394	7	Bn	2	0.417	0.715	1.399	5
395	8	Dk 1	1	0.167	1.155	0.866	5
396	9	Dk 2	1	0.167	1.155	0.866	5
397	10	Rf	4	3.500	0.990	1.010	6
398	11	St	1	0.250	1.595	0.627	7
399	12	Bd 2	1	0.250	1.595	0.627	7
400	13	Dk 3	1	0.250	1.595	0.627	7
401	H103 UGN2		—	—	—	—	—
402	1	Zr 1	2	1.500	1.479	0.676	1
403	2	So	2	0.625	1.167	0.857	2
404	3	St 1	1	0.500	1.807	0.553	2
405	4	Tg 1	8	5.583	0.871	1.148	3
406	5	St 2	1	0.125	1.199	0.834	4
407	6	Dk 1	1	0.125	1.199	0.834	4
408	7	Bn	3	1.625	1.150	0.870	4
409	8	Dk 2	1	0.125	1.199	0.834	4
410	9	Ts 1	4	2.625	1.134	0.882	4
411	10	Dk 3	1	0.125	1.199	0.834	4
412	11	Zr 2	2	0.625	0.805	1.242	4
413	12	Fl 1	2	1.333	1.462	0.684	5
414	13	Bd 1	1	0.333	1.479	0.676	5
415	14	Dk 4	1	0.250	1.462	0.684	5
416	15	Bd 2	1	0.250	1.462	0.684	5
417	16	Fl 2	2	1.250	1.446	0.692	5
418	17	Zr 3	2	0.600	0.756	1.323	5
419	18	Dk 5	1	0.500	1.791	0.558	6
420	19	Dk 6	1	0.500	1.774	0.564	6
421	20	Tg 2	10	6.333	0.723	1.383	6
422	21	Fl 3	2	1.100	1.035	0.966	7
423	22	Fl 4	2	1.100	1.035	0.966	7
424	23	Dk 7	1	0.100	1.051	0.951	7
425	24	Rf 1	1	0.100	1.051	0.951	7
426	25	Bd 3	1	0.100	1.051	0.951	7
427	26	Bn 2	3	0.683	0.887	1.127	7
428	27	Bn 3	2	0.350	0.969	1.032	7
429	28	Kj	2	0.600	1.035	0.966	7
430	29	Ts 2	2	0.600	1.035	0.966	7
431	30	Dk 8	1	0.500	1.364	0.733	8
432	31	Dk 9	1	0.500	1.364	0.733	8
433	32	Rf 2	3	1.333	1.150	0.870	8
434	33	Ts 3	4	1.833	1.134	0.882	8
435	34	Kc	2	1.000	1.347	0.742	8
436	35	Fl 5	2	1.333	1.462	0.684	9
437	36	Ts 4	2	1.333	1.462	0.684	9
438	37	Fl 6	2	1.250	1.446	0.692	9
439	38	Fl 7	2	1.250	1.446	0.692	9
440	39	Dk 10	1	0.500	1.791	0.558	10
441	40	Bd 4	1	0.500	1.791	0.558	10
442	41	Dk 11	1	0.500	1.774	0.564	10
443	42	Dk 12	1	0.500	1.774	0.564	10
444	H49 UGN-3		—	—	—	—	—
445	1	Zr 1	1	0.500	2.170	0.461	1
446	2	Zr 2	2	1.500	1.532	0.653	2
447	3	Zr 3	2	0.750	1.021	0.979	3
448	4	Tg 1	4	2.750	0.638	1.567	4
449	5	Dk 1	1	0.250	1.276	0.783	5
450	6	Tg 2	4	2.250	0.638	1.567	5
451	7	Kc	1	0.250	1.276	0.783	5
452	8	Rf 1	2	1.250	1.149	0.871	6
453	9	Bd	1	0.250	1.276	0.783	6
454	10	Rf 2	2	1.250	1.149	0.871	6
455	11	Dk 2	1	0.500	1.787	0.560	7
456	12	Dk 3	1	0.500	1.787	0.560	7

APPENDIX 18(6):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
457	H25 UGN-4		—	—	—	—	—
458	1	Zr 1	1	0.500	2.029	0.493	1
459	2	Zr 2	2	1.500	1.240	0.806	2
460	3	Ts	2	0.667	0.676	1.478	3
461	4	Tg	6	5.500	0.338	2.957	4
462	5	Dk 1	1	0.167	1.127	0.887	5
463	6	Dk 2	1	0.167	1.127	0.887	5
464	7	Dk 3	1	0.167	1.127	0.887	5
465	8	Bd	1	0.167	1.127	0.887	5
466	9	Kc	1	0.167	1.127	0.887	5
467	H41 UGN-5		—	—	—	—	—
468	1	So 1	1	0.500	1.507	0.664	1
469	2	So 2	2	1.167	0.829	1.206	2
470	3	Tg 1	6	4.750	0.301	3.318	3
471	4	Dk 1	1	0.167	0.980	1.021	4
472	5	Dk 2	1	0.167	0.980	1.021	4
473	6	Dk 3	1	0.167	0.980	1.021	4
474	7	Bd	1	0.167	0.980	1.021	4
475	8	Tg 2	4	3.167	0.527	1.896	4
476	9	St	1	0.250	1.206	0.829	5
477	10	Kc	1	0.250	1.206	0.829	5
478	11	Dk 4	1	0.250	1.206	0.829	5
479	H125 UGN6		—	—	—	—	—
480	1	So 1	1	0.333	1.783	0.561	1
481	2	So 2	3	2.500	1.252	0.799	2
482	3	Sg	1	0.333	1.783	0.561	3
483	4	So 3	2	0.500	0.873	1.146	3
484	5	Tg 1	6	4.333	0.569	1.757	4
485	6	Fl 1	2	1.167	1.024	0.976	5
486	7	Sr	1	0.167	1.100	0.909	5
487	8	Dk 1	1	0.167	1.100	0.909	5
488	9	Bd	1	0.167	1.100	0.909	5
489	10	Ts	3	1.500	0.721	1.387	5
490	11	Dk 2	1	0.500	1.555	0.643	6
491	12	Dk 3	1	0.333	1.252	0.799	6
492	13	Tg 2	3	1.833	1.024	0.976	6
493	14	Dk 4	1	0.333	1.555	0.643	7
494	15	Fl 2	2	1.333	1.480	0.676	7
495	16	Dk 5	1	0.500	2.011	0.497	8
496	H11 UGN-7		—	—	—	—	—
497	1	Zr	1	0.500	1.595	0.627	1
498	2	Ts	2	1.167	0.725	1.379	2
499	3	Tg	6	5.500	0.145	6.896	3
500	4	Bd	1	0.167	1.015	0.985	4
501	5	Dk 1	1	0.167	1.015	0.985	4
502	6	Dk 2	1	0.167	1.015	0.985	4
503	7	Kc	1	0.167	1.015	0.985	4
504	8	Dk 3	1	0.167	1.015	0.985	4
505	H136 UGN8		—	—	—	—	—
506	1	Zr 1	2	1.500	1.085	0.922	1
507	2	Zr 2	2	0.611	0.574	1.741	2
508	3	Bd1	1	0.500	1.723	0.580	2
509	4	Tg	9	8.500	0.191	5.223	3
510	5	Dk 1	1	0.111	0.830	1.205	4
511	6	Kc	1	0.111	0.830	1.205	4
512	7	Bd 2	1	0.111	0.830	1.205	4
513	8	Dk 2	1	0.111	0.830	1.205	4
514	9	Dk 3	1	0.111	0.830	1.205	4
515	10	Dk 4	1	0.111	0.830	1.205	4
516	11	Dk 5	1	0.111	0.830	1.205	4
517	12	Dk 6	1	0.111	0.830	1.205	4
518	H73 YKS-1		—	—	—	—	—
519	1	Zr 1	1	0.500	2.417	0.414	1
520	2	Zr 2	2	1.333	1.922	0.520	2
521	3	Kg	3	2.000	1.488	0.672	3
522	4	So 1	2	0.833	1.178	0.849	4
523	5	Bd 1	1	0.333	1.983	0.504	4
524	6	Zr 3	2	0.833	0.930	1.076	5
525	7	So 2	3	1.000	0.744	1.344	6
526	8	Bn	3	1.833	1.054	0.949	7
527	9	Tg	6	4.833	0.868	1.152	7
528	10	Rf 1	2	1.333	1.488	0.672	8
529	11	Dk 1	1	0.333	1.550	0.645	8
530	12	Dk 2	1	0.167	1.364	0.733	8
531	13	Dk 3	1	0.167	1.364	0.733	8
532	14	Bd 2	1	0.167	1.364	0.733	8
533	15	Kc	1	0.167	1.364	0.733	8
534	16	Rf 2	2	1.167	1.302	0.768	8
535	17	Dk 4	1	0.500	1.983	0.504	9
536	18	Dk 5	1	0.500	1.798	0.556	9
537	H119 YKS-2		—	—	—	—	—
538	1	Zr 1	1	0.500	1.705	0.587	1
539	2	Zr 2	2	1.333	1.100	0.909	2
540	3	Zr 3	3	1.033	0.605	1.653	3
541	4	Tg	5	3.667	0.550	1.819	4
542	5	Ts 1	3	2.333	0.990	1.010	4
543	6	Dk 1	1	0.200	1.155	0.866	5
544	7	Dk 2	1	0.200	1.155	0.866	5
545	8	Dk 3	1	0.200	1.155	0.866	5
546	9	Ts 2	3	2.200	0.935	1.070	5
547	10	Dk 4	1	0.333	1.595	0.627	5
548	11	Dk 5	1	0.333	1.595	0.627	5
549	12	Bd	1	0.333	1.540	0.649	6
550	13	Kc	1	0.333	1.540	0.649	6

APPENDIX 18(7):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
551	H130 YKS-3		—	—	—	—	—
552	1	Fr	2	1.000	1.542	0.649	1
553	2	Zr 1	2	1.000	1.624	0.616	2
554	3	Zr 2	2	1.000	1.483	0.674	2
555	4	Zr 3	2	1.000	1.730	0.578	3
556	5	Zr 4	2	1.000	1.448	0.691	3
557	6	Ts 1	2	0.700	1.860	0.538	4
558	7	Ts 2	2	0.643	1.436	0.696	4
559	8	Tg 1	5	3.333	2.013	0.497	5
560	9	Tg 2	7	4.833	1.448	0.691	5
561	10	Bn 1	2	1.200	2.354	0.425	6
562	11	Bn 2	3	1.700	2.283	0.438	6
563	12	Dk 1	1	0.200	2.377	0.421	6
564	13	Bd 1	1	0.200	2.377	0.421	6
565	14	Bd 2	1	0.143	1.813	0.552	6
566	15	Dk 2	1	0.143	1.813	0.552	6
567	16	Fl 1	2	1.143	1.789	0.559	6
568	17	Bn 3	3	1.476	1.718	0.582	6
569	18	Kc	1	0.143	1.813	0.552	6
570	19	Bn 4	2	0.476	1.718	0.582	6
571	20	Dk 3	1	0.500	2.719	0.368	7
572	21	Ts 3	2	0.833	2.601	0.384	7
573	22	Bd 3	1	0.333	2.648	0.378	7
574	23	Dk 4	1	0.500	2.154	0.464	7
575	24	Rf 1	3	2.333	2.036	0.491	7
576	25	Bd 4	1	0.333	2.083	0.480	7
577	26	Fl 2	3	2.000	2.013	0.497	7
578	27	Rf 2	2	1.500	2.942	0.340	8
579	28	Dk 5	1	0.333	2.401	0.416	8
580	29	Dk 6	1	0.333	2.401	0.416	8
581	30	Bd 5	1	0.333	2.377	0.421	8
582	31	Dk 7	2	1.333	2.354	0.425	8
583	32	Dk 8	1	0.500	3.307	0.302	9
584	33	Kw	1	0.500	2.719	0.368	9
585	H105 YKS-4		—	—	—	—	—
586	1	Zr	2	1.500	1.570	0.637	1
587	2	Dk 1	1	0.500	2.552	0.392	2
588	3	So	2	0.833	0.981	1.019	2
589	4	Tg	3	2.000	0.785	1.274	3
590	5	Fl	2	1.333	1.374	0.728	4
591	6	Bd	1	0.333	1.766	0.566	4
592	7	Dk 2	1	0.500	2.355	0.425	5
593	H137 YKS-5		—	—	—	—	—
594	1	Zr	2	1.000	1.442	0.694	1
595	2	So 1	2	1.000	1.442	0.694	2
596	3	So 2	2	1.000	1.538	0.650	2
597	4	So 3	2	1.000	1.538	0.650	3
598	5	Ts1	2	0.750	1.730	0.578	3
599	6	Ts 2	2	0.750	1.730	0.578	4
600	7	Tg 1	4	3.500	2.018	0.496	4
601	8	Tg 2	4	3.500	2.018	0.496	5
602	9	Bd 1	1	0.250	2.595	0.385	5
603	10	Dk 1	1	0.250	2.595	0.385	5
604	11	Dk 2	1	0.250	2.595	0.385	5
605	12	Dk 3	1	0.250	2.595	0.385	6
606	13	Dk 4	1	0.250	2.595	0.385	6
607	14	Bd 2	1	0.250	2.595	0.385	6
608	H133 ZNG-1		—	—	—	—	—
609	1	Zr 1	1	0.500	1.689	0.592	1
610	2	Zr 2	3	1.750	0.961	1.040	1
611	3	Zr 3	2	1.200	1.221	0.819	2
612	4	Dk 1	1	0.333	1.429	0.700	2
613	5	Zr 4	2	0.533	0.753	1.327	2
614	6	Tg 1	4	3.333	1.273	0.786	2
615	7	Tg 2	5	3.700	0.805	1.242	3
616	8	Tg 3	5	2.200	0.598	1.674	3
617	9	Dk 2	1	0.250	1.741	0.574	3
618	10	Dk 3	1	0.250	1.741	0.574	3
619	11	Bd 1	1	0.250	1.741	0.574	3
620	12	Dk 4	1	0.200	1.273	0.786	4
621	13	Dk 5	1	0.200	1.273	0.786	4
622	14	Bd 2	1	0.200	1.273	0.786	4
623	15	Rf 1	2	1.200	1.013	0.987	4
624	16	Rf 2	2	1.200	1.013	0.987	4
625	17	Kc	2	1.200	1.013	0.987	4
626	18	Dk 6	1	0.500	1.481	0.675	5
627	19	Dk 7	1	0.500	1.481	0.675	5
628	20	Bd 3	1	0.500	1.481	0.675	5
629	H144 ZNG-2		—	—	—	—	—
630	1	Zr 1	2	1.500	1.674	0.597	1
631	2	Sg	1	0.500	2.186	0.457	1
632	3	Fr	2	1.000	1.230	0.813	2
633	4	Tg 1	2	0.700	0.854	1.171	3
634	5	Bn	5	3.167	0.547	1.829	4
635	6	Tg 2	1	0.200	1.059	0.944	5
636	7	Bd	6	4.533	0.581	1.722	5
637	8	Rf 1	2	1.200	0.991	1.009	5
638	9	Dk 1	1	0.200	1.059	0.944	5
639	10	Dk 2	1	0.167	1.093	0.915	6
640	11	Tg 3	1	0.167	1.093	0.915	6
641	12	Kc	3	2.167	0.957	1.045	6
642	13	Dk 3	1	0.167	1.093	0.915	6
643	14	Dk 4	1	0.167	1.093	0.915	6
644	15	Rf 2	1	0.500	1.503	0.665	6
645	16	Dk 5	1	0.333	1.469	0.681	7
646	17	Dk 6	1	0.333	1.469	0.681	7

APPENDIX 18(8):RRA MEASURES (WITHOUT EXTERIOR)

№	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
647	H155 ZNG-3		—	—	—	—	—
648	1	Zr 1	1	0.500	1.393	0.718	1
649	2	Zr 2	2	1.500	1.082	0.924	2
650	3	Ts 1	2	0.611	0.785	1.274	3
651	4	Kg 1	9	4.783	0.501	1.998	4
652	5	Kg 2	4	2.111	0.663	1.508	5
653	6	Zr 3	2	0.361	0.717	1.395	5
654	7	Md 1	1	0.111	0.812	1.232	5
655	8	Md 2	1	0.111	0.812	1.232	5
656	9	Zr 4	2	0.361	0.731	1.369	5
657	10	Zr 5	2	0.361	0.758	1.320	5
658	11	Tg 1	5	3.611	0.744	1.344	5
659	12	Tg 2	3	1.611	0.771	1.297	5
660	13	Zr 6	2	0.450	0.906	1.103	6
661	14	Bd 1	1	0.250	0.974	1.027	6
662	15	Zr 7	2	0.583	0.934	1.071	6
663	16	Tg 3	4	2.750	0.947	1.056	6
664	17	Tg 4	4	2.833	0.974	1.027	6
665	18	Tg 5	4	3.500	1.028	0.973	6
666	19	Dk 1	1	0.200	1.055	0.948	6
667	20	Kc 1	1	0.200	1.055	0.948	6
668	21	Bd 2	1	0.200	1.055	0.948	6
669	22	Rf 1	2	1.200	1.042	0.960	6
670	23	Rf 2	2	1.333	1.069	0.936	6
671	24	Bd 3	1	0.333	1.082	0.924	6
672	25	Tg 6	5	4.500	1.163	0.859	7
673	26	Tg 7	3	2.500	1.218	0.821	7
674	27	Dk 2	1	0.250	1.258	0.795	7
675	28	Dk 3	1	0.250	1.258	0.795	7
676	29	Ts 3	4	3.250	1.218	0.821	7
677	30	Bd 4	1	0.250	1.285	0.778	7
678	31	Rf 3	3	2.250	1.258	0.795	7
679	32	Dk 4	1	0.250	1.285	0.778	7
680	33	Dk 5	1	0.250	1.339	0.747	7
681	34	Dk 6	1	0.250	1.339	0.747	7
682	35	Bd 5	1	0.250	1.339	0.747	7
683	36	Dk 7	1	0.500	1.353	0.739	7
684	37	Dk 8	1	0.500	1.380	0.725	7
685	38	Dk 9	1	0.200	1.475	0.678	8
686	39	Dk 10	1	0.200	1.475	0.678	8
687	40	Kc 2	1	0.200	1.475	0.678	8
688	41	Bd 6	1	0.200	1.475	0.678	8
689	42	Dk 11	1	0.333	1.529	0.654	8
690	43	Dk 12	1	0.333	1.529	0.654	8
691	44	Md 3	1	0.250	1.529	0.654	8
692	45	Bd 7	1	0.250	1.529	0.654	8
693	46	Dk 13	1	0.250	1.529	0.654	8
694	47	Dk 14	1	0.333	1.569	0.637	8
695	48	Dk 15	1	0.333	1.569	0.637	8
696	H71 ZNG-4		—	—	—	—	—
697	1	Zr	2	1.500	1.503	0.665	1
698	2	Sg	1	0.500	2.016	0.496	2
699	3	Kg	2	0.750	1.059	0.944	2
700	4	Tg 1	4	2.083	0.683	1.464	3
701	5	So	3	1.583	0.922	1.084	4
702	6	Dk 1	4	2.750	0.786	1.273	4
703	7	Tg 2	1	0.250	1.196	0.836	4
704	8	Rf1	3	2.333	1.298	0.770	5
705	9	Dk 2	1	0.333	1.435	0.697	5
706	10	Dk 3	1	0.250	1.298	0.770	5
707	11	Bd	2	0.583	1.093	0.915	5
708	12	Rf 2	1	0.250	1.298	0.770	5
709	13	Dk 4	1	0.333	1.811	0.552	6
710	14	Dk 5	1	0.333	1.811	0.552	6
711	15	Dk 6	3	2.500	1.469	0.681	6
712	16	Dk 7	1	0.333	1.981	0.505	7
713	17	Dk 8	1	0.333	1.981	0.505	7
714	H34 ZNG-5		—	—	—	—	—
715	1	Zr 1	1	0.500	2.909	0.344	1
716	2	Zr 2	2	1.500	2.182	0.458	2
717	3	Zr 3	2	1.000	1.636	0.611	3
718	4	Zr 4	2	1.000	1.273	0.786	4
719	5	Md	2	0.833	1.091	0.917	5
720	6	Tg	3	1.833	1.091	0.917	6
721	7	Bd	1	0.333	1.818	0.550	7
722	8	Rf	3	2.333	1.455	0.688	7
723	9	Dk 1	1	0.333	2.182	0.458	8
724	10	Dk 2	1	0.333	2.182	0.458	8
725	H26 ZNG-6		—	—	—	—	—
726	1	Zr 1	1	0.500	2.029	0.493	1
727	2	Zr 2	2	1.250	1.240	0.806	2
728	3	Tg	4	3.000	0.676	1.478	3
729	4	Rf	2	0.583	0.789	1.267	4
730	5	Md	1	0.250	1.466	0.682	4
731	6	Bd	1	0.250	1.466	0.682	4
732	7	Fl	3	2.500	1.127	0.887	5
733	8	Dk 1	1	0.333	1.916	0.522	6
734	9	Dk 2	1	0.333	1.916	0.522	6

APPENDIX 18(9):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
735	H50 BZW-1		—	—	—	—	—
736	1	Zr	1	0.500	2.234	0.448	1
737	2	So 1	2	1.500	1.595	0.627	2
738	3	So 2	2	0.750	1.085	0.922	3
739	4	Tg	4	2.750	0.702	1.424	4
740	5	Dk 1	1	0.250	1.340	0.746	5
741	6	Rf 1	4	2.750	0.702	1.424	5
742	7	Bd	1	0.250	1.340	0.746	5
743	8	Dk 2	1	0.250	1.340	0.746	6
744	9	Bn	2	0.750	1.085	0.922	6
745	10	Dk 3	1	0.250	1.340	0.746	6
746	11	Rf 2	2	1.500	1.595	0.627	7
747	12	Dk 4	1	0.500	2.234	0.448	8
748	H67 BZW-2		—	—	—	—	—
749	1	Zr 1	1	0.500	1.879	0.532	1
750	2	Zr 2	2	1.333	1.367	0.732	2
751	3	Sr	3	1.750	0.922	1.084	3
752	4	Kc	1	0.333	1.435	0.697	4
753	5	Tg	4	1.917	0.615	1.626	4
754	6	Bn	4	2.083	0.649	1.541	5
755	7	Bd 1	1	0.250	1.127	0.887	5
756	8	Rf 1	3	2.250	0.991	1.009	5
757	9	Dk 1	1	0.250	1.162	0.861	6
758	10	Cr	3	1.750	0.957	1.045	6
759	11	Rf 2	2	1.250	1.093	0.915	6
760	12	Dk 2	1	0.333	1.503	0.665	6
761	13	Dk 3	1	0.333	1.503	0.665	6
762	14	Rf 3	2	1.333	1.401	0.714	7
763	15	Bd 2	1	0.333	1.469	0.681	7
764	16	Dk 4	1	0.500	1.606	0.623	7
765	17	Dk 5	1	0.500	1.913	0.523	8
766	H12 BZW-3		—	—	—	—	—
767	1	Zr 1	1	0.500	2.465	0.406	1
768	2	Zr 2	2	1.500	1.595	0.627	2
769	3	Zr 3	2	0.833	1.015	0.985	3
770	4	Tg	3	1.833	0.725	1.379	4
771	5	Bd	1	0.333	1.595	0.627	5
772	6	Rf	3	2.333	1.015	0.985	5
773	7	Dk 1	1	0.333	1.885	0.530	6
774	8	Dk 2	1	0.333	1.885	0.530	6
775	H4 BZW-4		—	—	—	—	—
776	1	Zr	1	0.250	1.420	0.704	1
777	2	Tg	4	4.000	0.000	—	2
778	3	Dk 1	1	0.250	1.420	0.704	3
779	4	Dk 2	1	0.250	1.420	0.704	3
780	5	Bd	1	0.250	1.420	0.704	3
781	H44 BZW-5		—	—	—	—	—
782	1	Zr 1	2	1.500	1.787	0.560	1
783	2	Sr	1	0.500	2.425	0.412	2
784	3	Zr 2	2	1.000	1.276	0.783	2
785	4	Zr 3	2	0.750	0.893	1.119	3
786	5	Tg 1	4	2.250	0.638	1.567	4
787	6	Bd	1	0.250	1.276	0.783	5
788	7	Rf	4	3.250	0.893	1.119	5
789	8	Tg 2	2	1.250	1.149	0.871	5
790	9	Dk 1	1	0.250	1.532	0.653	6
791	10	Dk 2	1	0.250	1.532	0.653	6
792	11	Dk 3	1	0.250	1.532	0.653	6
793	12	Dk 4	1	0.500	1.787	0.560	6
794	H139 DBZ-1		—	—	—	—	—
795	1	Zr 1	1	0.250	1.537	0.650	1
796	2	Zr 2	4	3.250	1.025	0.976	2
797	3	Kc	1	0.250	1.537	0.650	3
798	4	Bd 1	1	0.250	1.537	0.650	3
799	5	Tg	4	1.750	0.717	1.394	3
800	6	Rf 1	2	1.250	1.162	0.861	4
801	7	Bn	2	0.500	0.752	1.331	4
802	8	Rf 2	2	1.250	1.162	0.861	4
803	9	Dk 1	1	0.500	1.674	0.597	5
804	10	Vr	4	2.333	0.854	1.171	5
805	11	Dk 2	1	0.500	1.674	0.597	5
806	12	Rf 3	3	2.250	1.230	0.813	6
807	13	Bd 2	1	0.250	1.367	0.732	6
808	14	Rf 4	2	1.250	1.298	0.770	6
809	15	Dk 3	1	0.333	1.742	0.574	7
810	16	Dk 4	1	0.333	1.742	0.574	7
811	17	Dk 5	1	0.500	1.811	0.552	7

APPENDIX 18(10):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
812	H153 DBZ-2		—	—	—	—	—
813	1	Zr 1	3	1.333	1.032	0.969	1
814	2	Zr 2	2	0.583	1.039	0.962	2
815	3	Zr 3	3	1.083	1.248	0.801	2
816	4	Zr 4	2	0.583	1.151	0.869	2
817	5	Kg	4	1.667	1.060	0.943	3
818	6	Tg 1	4	2.833	1.506	0.664	3
819	7	Sr1	2	1.333	1.548	0.646	3
820	8	Ts 1	4	2.667	1.283	0.779	3
821	9	Sr 2	2	1.250	1.360	0.735	4
822	10	Tg 3	3	1.750	1.304	0.767	4
823	11	Sr 3	3	1.450	1.206	0.829	4
824	12	Dk 1	1	0.250	1.820	0.549	4
825	13	Fl 1	2	1.250	1.806	0.554	4
826	14	Bd 1	1	0.250	1.820	0.549	4
827	15	Dk 2	1	0.500	1.862	0.537	4
828	16	Dk 3	1	0.250	1.597	0.626	4
829	17	Dk 4	1	0.250	1.597	0.626	4
830	18	Tg 4	6	4.750	1.457	0.686	4
831	19	Dk 5	1	0.500	1.674	0.598	5
832	20	Bd 2	1	0.333	1.618	0.618	5
833	21	Rf 1	2	0.667	1.576	0.635	5
834	22	Bd 3	1	0.333	1.520	0.658	5
835	23	Tg 5	5	3.333	1.381	0.724	5
836	24	Dk 6	1	0.500	2.120	0.472	5
837	25	Ts 2	2	0.417	1.702	0.588	5
838	26	Dk 7	1	0.167	1.771	0.565	5
839	27	Dk 8	1	0.167	1.771	0.565	5
840	28	Bd 4	1	0.167	1.771	0.565	5
841	29	Dk 9	1	0.167	1.771	0.565	5
842	30	Fl 2	3	2.500	1.862	0.537	6
843	31	Dk 10	1	0.200	1.695	0.590	6
844	32	Fl 3	2	1.200	1.681	0.595	6
845	33	Dk 11	1	0.200	1.695	0.590	6
846	34	Ts 3	2	0.533	1.625	0.615	6
847	35	Tg 6	4	3.000	1.960	0.510	6
848	36	Dk 12	1	0.333	2.176	0.460	7
849	37	Dk 13	1	0.333	2.176	0.460	7
850	38	Dk 14	1	0.500	1.994	0.501	7
851	39	Tg 7	3	1.833	1.883	0.531	7
852	40	Kc	1	0.250	2.273	0.440	7
853	41	Bd 5	1	0.250	2.273	0.440	7
854	42	Rf 2	2	1.250	2.259	0.443	7
855	43	Fl 4	3	2.333	2.169	0.461	8
856	44	Bd 6	1	0.333	2.197	0.455	8
857	45	Dk 15	1	0.500	2.573	0.389	8
858	46	Dk 16	1	0.333	2.483	0.403	9
859	47	Dk 17	1	0.333	2.483	0.403	9
860	H20 DBZ-3		—	—	—	—	—
861	1	Zr 1	1	0.333	1.578	0.634	1
862	2	Zr 2	3	1.833	0.789	1.267	2
863	3	Rf 1	2	1.333	1.353	0.739	3
864	4	Tg	3	1.333	0.676	1.478	3
865	5	Dk 1	1	0.500	2.142	0.467	4
866	6	Bd	2	1.333	1.240	0.806	4
867	7	Rf 2	2	1.333	1.240	0.806	4
868	8	Ms	1	0.500	2.029	0.493	5
869	9	Dk 2	1	0.500	2.029	0.493	5
870	H135 DBZ-4		—	—	—	—	—
871	1	Zr 1	1	0.500	1.468	0.681	1
872	2	Zr 2	2	1.143	0.830	1.205	2
873	3	Tg	7	5.500	0.319	3.134	3
874	4	Rf 1	2	0.643	0.702	1.424	4
875	5	Ms	1	0.143	0.957	1.045	4
876	6	Kc	1	0.143	0.957	1.045	4
877	7	Sr	1	0.143	0.957	1.045	4
878	8	Rf 2	2	1.143	0.830	1.205	4
879	9	Dk 1	1	0.143	0.957	1.045	4
880	10	Dk 2	2	1.500	1.213	0.825	5
881	11	Dk 3	1	0.500	1.468	0.681	5
882	12	Dk 4	1	0.500	1.851	0.540	6
883	H124 DBZ-5		—	—	—	—	—
884	1	Zr 1	2	1.333	1.707	0.586	1
885	2	Dk 1	1	0.500	2.238	0.447	2
886	3	Kg	3	2.000	1.252	0.799	2
887	4	So	2	0.533	0.948	1.054	3
888	5	Bd	1	0.333	1.783	0.561	3
889	6	Tg	5	3.333	0.721	1.387	4
890	7	Kc	1	0.200	1.252	0.799	5
891	8	Ms	1	0.200	1.252	0.799	5
892	9	Rf 1	2	1.200	1.176	0.850	5
893	10	Fl	3	1.700	0.873	1.146	5
894	11	Dk 2	1	0.500	1.707	0.586	6
895	12	Dk 3	1	0.333	1.404	0.712	6
896	13	Bn	2	0.667	1.176	0.850	6
897	14	Rf 2	3	2.500	1.555	0.643	7
898	15	Dk 4	1	0.333	2.086	0.479	8
899	16	Dk 5	1	0.333	2.086	0.479	8

APPENDIX 18 (11):RRA MEASURES (WITHOUT EXTERIOR)

Nb	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
900	H148 DRM1		-	-	-	-	-
901	1	Zr 1	1	0.500	1.466	0.682	1
902	2	Zr 2	2	1.200	1.050	0.953	2
903	3	Kg	5	2.583	0.670	1.493	3
904	4	Rf 1	2	1.200	1.050	0.953	4
905	5	Sr 1	3	0.950	0.760	1.315	4
906	6	Tg 1	4	2.033	0.796	1.256	4
907	7	Bd 1	1	0.200	1.086	0.921	4
908	8	Dk 1	1	0.500	1.466	0.682	5
909	9	Rf 2	2	1.333	1.140	0.877	5
910	10	Tg 2	4	2.167	0.959	1.042	5
911	11	Bd 2	1	0.250	1.213	0.825	5
912	12	Bn	2	0.750	1.104	0.906	5
913	13	Rf 3	3	2.250	1.140	0.877	5
914	14	Dk 2	1	0.500	1.557	0.642	6
915	15	Sr 2	2	1.250	1.339	0.747	6
916	16	Dk 3	1	0.250	1.376	0.727	6
917	17	Ts	3	2.250	1.303	0.767	6
918	18	Kw	2	1.000	1.448	0.691	6
919	19	Dk 4	1	0.333	1.557	0.642	6
920	20	Dk 5	1	0.333	1.557	0.642	6
921	21	Dk 6	1	0.500	1.756	0.570	7
922	22	Kc	1	0.333	1.719	0.582	7
923	23	Bd 3	1	0.333	1.719	0.582	7
924	24	Rf 4	2	1.500	1.828	0.547	7
925	25	Dk 7	1	0.500	2.244	0.446	8
926	H21 DRM-2		-	-	-	-	-
927	1	Zr 1	1	0.333	1.578	0.634	1
928	2	Kg	3	2.250	0.789	1.267	2
929	3	Bd	1	0.333	1.578	0.634	3
930	4	Tg	4	2.667	0.451	2.218	3
931	5	Kc	1	0.250	1.240	0.806	4
932	6	Rf	3	2.250	0.789	1.267	4
933	7	Dk 1	1	0.250	1.240	0.806	4
934	8	Dk 2	1	0.333	1.578	0.634	5
935	9	Dk 3	1	0.333	1.578	0.634	5
936	H109 DRM3		-	-	-	-	-
937	1	Zr 1	1	0.500	2.182	0.458	1
938	2	Zr 2	2	1.500	1.455	0.688	2
939	3	Kg	2	0.750	0.909	1.100	3
940	4	Tg 1	4	2.750	0.545	1.833	4
941	5	Dk 1	1	0.250	1.273	0.786	5
942	6	Tg 2	4	3.250	0.727	1.375	5
943	7	Kc	1	0.250	1.273	0.786	5
944	8	Dk 2	1	0.250	1.455	0.688	6
945	9	Bd	1	0.250	1.455	0.688	6
946	10	Dk 3	1	0.250	1.455	0.688	6
947	H2 DRM-4		-	-	-	-	-
948	1	Zr 1	2	1.500	1.581	0.633	1
949	2	So 1	2	0.750	1.147	0.872	2
950	3	Dk 1	1	0.500	2.076	0.482	2
951	4	Sr	4	2.500	0.775	1.291	3
952	5	Dk 2	1	0.250	1.271	0.787	4
953	6	So 2	2	0.417	0.837	1.195	4
954	7	Bn	2	0.583	1.023	0.978	4
955	8	Tg	6	5.000	0.961	1.041	5
956	9	Fl	3	2.000	1.333	0.750	5
957	10	Rf	2	1.167	1.395	0.717	6
958	11	Dk 3	1	0.167	1.457	0.687	6
959	12	Dk 4	1	0.167	1.457	0.687	6
960	13	Dk 5	1	0.167	1.457	0.687	6
961	14	Bd 1	1	0.167	1.457	0.687	6
962	15	Dk 6	1	0.333	1.829	0.547	6
963	16	Dk 7	2	1.333	1.767	0.566	6
964	17	Dk 8	1	0.500	1.891	0.529	7
965	18	Bd 2	1	0.500	2.262	0.442	7
966	H22 DRM-5		-	-	-	-	-
967	1	Zr 1	1	0.500	2.142	0.467	1
968	2	Zr 2	2	1.500	1.353	0.739	2
969	3	Zr 3	2	0.700	0.789	1.267	3
970	4	Tg	5	4.000	0.451	2.218	4
971	5	Bd 1	1	0.200	1.240	0.806	5
972	6	Bd 2	1	0.200	1.240	0.806	5
973	7	Fl	2	1.200	1.015	0.986	5
974	8	Dk 1	1	0.200	1.240	0.806	5
975	9	Dk 2	1	0.500	1.804	0.554	6

APPENDIX 18 (12):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr	RRA	1 X RRA	Depth
976	H134 DAR1		–	–	–	–	–
977	1	Zr 1	1	0.500	1.510	0.662	1
978	2	Sg	1	0.500	1.510	0.662	1
979	3	Zr 2	2	1.250	1.075	0.930	2
980	4	Dk 1	2	1.250	1.075	0.930	2
981	5	Ts	4	1.700	0.682	1.465	3
982	6	Tg	5	3.583	0.827	1.209	4
983	7	Bn	2	0.417	0.744	1.343	4
984	8	Dk 2	1	0.200	1.261	0.793	5
985	9	Ms	1	0.200	1.261	0.793	5
986	10	Rf 1	3	1.700	1.137	0.879	5
987	11	Kc 1	1	0.200	1.261	0.793	5
988	12	Kw	6	4.333	0.848	1.179	5
989	13	Dk 3	1	0.333	1.572	0.636	6
990	14	Rf 2	2	1.333	1.530	0.653	6
991	15	Kc 2	1	0.167	1.282	0.780	6
992	16	Bd	1	0.167	1.282	0.780	6
993	17	Dk 4	1	0.167	1.282	0.780	6
994	18	Rf 2	3	2.167	1.199	0.834	6
995	19	Vr	2	1.167	1.241	0.806	6
996	20	Dk 5	1	0.500	1.965	0.509	7
997	21	Dk 6	1	0.333	1.634	0.612	7
998	22	Dk 7	1	0.333	1.634	0.612	7
999	23	Kw	1	0.500	1.675	0.597	7
1000	H110 DAR2		–	–	–	–	–
1001	1	Zr 1	2	1.500	1.364	0.733	1
1002	2	Zr 2	2	0.700	0.818	1.222	2
1003	3	Sg	1	0.500	2.091	0.478	2
1004	4	Tg 1	5	3.833	0.455	2.200	3
1005	5	Dk 1	1	0.200	1.182	0.846	3
1006	6	Bd	1	0.200	1.182	0.846	3
1007	7	Dk 2	1	0.200	1.182	0.846	3
1008	8	Tg 2	3	2.200	0.818	1.222	5
1009	9	Dk 3	1	0.333	1.545	0.647	4
1010	10	Rj	1	0.333	1.545	0.647	4
1011	H76 DAR-3		–	–	–	–	–
1012	1	Zr 1	1	0.500	2.231	0.448	1
1013	2	Zr 2	2	1.500	1.736	0.576	2
1014	3	Zr 3	2	0.833	1.302	0.768	3
1015	4	Tg 1	3	1.750	0.930	1.076	4
1016	5	Ts	4	2.083	0.682	1.467	5
1017	6	Bd	1	0.333	1.426	0.701	5
1018	7	Tg 2	4	2.583	0.868	1.152	6
1019	8	Dk 1	1	0.250	1.178	0.849	6
1020	9	Bn	2	0.583	0.930	1.076	6
1021	10	St	1	0.250	1.364	0.733	7
1022	11	Kc	1	0.250	1.364	0.733	7
1023	12	Fl	3	2.250	1.240	0.807	7
1024	13	Rf 1	3	2.000	1.240	0.807	7
1025	14	Dk 2	1	0.333	1.736	0.576	8
1026	15	Dk 3	1	0.333	1.736	0.576	8
1027	16	Rf 2	2	1.333	1.674	0.598	8
1028	17	Dk 4	1	0.333	1.736	0.576	8
1029	18	Dk 5	1	0.500	2.169	0.461	9
1030	H87 DAR-4		–	–	–	–	–
1031	1	Dk 1	1	0.500	2.042	0.490	1
1032	2	Zr 1	2	1.250	1.404	0.712	2
1033	3	Zr 2	4	2.333	0.893	1.119	3
1034	4	Dk 2	1	0.250	1.532	0.653	4
1035	5	Kg	3	1.000	0.702	1.424	4
1036	6	Dk 3	2	0.583	1.085	0.922	4
1037	7	Rf	4	2.667	0.702	1.424	5
1038	8	Dk 4	1	0.250	1.340	0.746	6
1039	9	Tg	3	2.250	1.085	0.922	6
1040	10	Dk 5	1	0.250	1.340	0.746	6
1041	11	Dk 6	1	0.333	1.723	0.580	7
1042	12	Bd	1	0.333	1.723	0.580	7
1043	H97 DAR-5		–	–	–	–	–
1044	1	Zr 1	2	1.000	1.267	0.789	1
1045	2	Zr 2	2	1.000	1.622	0.616	1
1046	3	Zr 3	2	0.750	0.956	1.047	2
1047	4	Zr 4	2	1.500	2.022	0.495	2
1048	5	Tg 1	4	2.033	0.689	1.452	3
1049	6	Dk 1	1	0.500	2.467	0.405	3
1050	7	Rf 1	3	2.250	1.044	0.957	4
1051	8	Kc	1	0.250	1.133	0.882	4
1052	9	Tg 2	5	2.450	0.644	1.552	4
1053	10	Dk 2	1	0.333	1.489	0.672	5
1054	11	Dk 3	1	0.333	1.489	0.672	5
1055	12	Bn	2	0.700	1.000	1.000	5
1056	13	Rf 2	2	1.200	1.044	0.957	5
1057	14	Rf 3	5	4.200	0.911	1.098	5
1058	15	Bd	1	0.200	1.089	0.918	5
1059	16	Rf 4	2	1.500	1.400	0.714	6
1060	17	Dk 4	1	0.500	1.489	0.672	6
1061	18	Dk 5	1	0.200	1.356	0.738	6
1062	19	Dk 6	1	0.200	1.356	0.738	6
1063	20	Dk 7	1	0.200	1.356	0.738	6
1064	21	Dk 8	1	0.200	1.356	0.738	6
1065	22	Dk 9	1	0.500	1.844	0.542	7

APPENDIX 18 (13):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1066	H98 GBR-1		—	—	—	—	—
1067	1	Gr	1	0.333	1.489	0.672	1
1068	2	Zr 1	3	1.750	1.055	0.948	1
1069	3	Fl 1	4	2.476	0.724	1.382	1
1070	4	Zr 2	2	0.833	1.117	0.895	2
1071	5	Tg	7	3.917	0.476	2.102	2
1072	6	Dk 1	1	0.250	1.158	0.863	2
1073	7	Bd 1	1	0.250	1.158	0.863	2
1074	8	Zr 3	2	0.643	0.827	1.209	3
1075	9	Kc	1	0.143	0.910	1.099	3
1076	10	Fl 2	3	2.143	0.827	1.209	3
1077	11	Fl 3	3	2.143	0.827	1.209	3
1078	12	St	1	0.143	0.910	1.099	3
1079	13	Bn	2	0.393	0.662	1.511	3
1080	14	Dk 2	1	0.333	1.261	0.793	4
1081	15	Wc 1	1	0.333	1.261	0.793	4
1082	16	Dk 3	1	0.333	1.261	0.793	4
1083	17	Wc 2	1	0.333	1.261	0.793	4
1084	18	Fl 4	4	2.833	0.889	1.125	4
1085	19	Ts	3	2.250	1.241	0.806	5
1086	20	Kw	1	0.250	1.324	0.756	5
1087	21	Dk 4	1	0.250	1.324	0.756	5
1088	22	Bd 2	1	0.333	1.675	0.597	6
1089	23	Dk 5	1	0.333	1.675	0.597	6
1090	H30 GBR-2		—	—	—	—	—
1091	1	Zr 1	1	0.500	2.454	0.407	1
1092	2	Zr 2	2	1.500	1.727	0.579	2
1093	3	Zr 3	2	1.000	1.182	0.846	3
1094	4	Ts	2	0.700	0.818	1.222	4
1095	5	Tg	5	4.000	0.636	1.571	5
1096	6	Bd	1	0.200	1.364	0.733	6
1097	7	Kc	1	0.200	1.364	0.733	6
1098	8	Rf	2	1.200	1.182	0.846	6
1099	9	Dk 1	1	0.200	1.364	0.733	6
1100	10	Dk 2	1	0.500	1.909	0.524	7
1101	H31 GBR-3		—	—	—	—	—
1102	1	Zr 1	2	1.500	2.000	0.500	1
1103	2	Dk 1	1	0.500	2.727	0.367	2
1104	3	Zr 2	2	1.000	1.455	0.688	2
1105	4	Zr 3	2	1.000	1.091	0.917	3
1106	5	Zr 4	2	0.700	0.909	1.100	4
1107	6	Tg	5	4.500	0.909	1.100	5
1108	7	Dk 2	1	0.200	1.636	0.611	6
1109	8	Dk 3	1	0.200	1.636	0.611	6
1110	9	Bd	1	0.200	1.636	0.611	6
1111	10	Dk 4	1	0.200	1.636	0.611	6
1112	H56 GBR-4		—	—	—	—	—
1113	1	Zr 1	2	1.500	1.682	0.595	1
1114	2	Sg	1	0.500	2.258	0.443	2
1115	3	Zr 2	2	1.000	1.201	0.832	2
1116	4	Kc	2	0.700	0.817	1.224	3
1117	5	Tg	5	3.083	0.529	1.892	4
1118	6	Ts	3	2.200	0.913	1.095	5
1119	7	Dk 1	1	0.200	1.105	0.905	5
1120	8	Dk 2	1	0.200	1.105	0.905	5
1121	9	Rf	4	3.200	0.817	1.224	5
1122	10	Bd	1	0.333	1.490	0.671	6
1123	11	Wk	1	0.333	1.490	0.671	6
1124	12	Dk 3	1	0.250	1.393	0.718	6
1125	13	Dk 4	1	0.250	1.393	0.718	6
1126	14	Dk 5	1	0.250	1.393	0.718	6
1127	H37 GBR-5		—	—	—	—	—
1128	1	Zr 1	1	0.500	1.507	0.664	1
1129	2	Kc	2	1.167	0.829	1.206	2
1130	3	Tg 1	6	4.333	0.301	3.318	3
1131	4	Rf	2	1.167	0.829	1.206	4
1132	5	Dk 1	1	0.167	0.980	1.021	4
1133	6	Tg 2	3	2.167	0.678	1.475	4
1134	7	Bd	1	0.167	0.980	1.021	4
1135	8	Dk 2	1	0.167	0.980	1.021	4
1136	9	Dk 3	1	0.500	1.507	0.664	5
1137	10	Dk 4	1	0.333	1.356	0.737	5
1138	11	Dk 5	1	0.333	1.356	0.737	5

APPENDIX 18 (14):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1139	H101 KOK1		—	—	—	—	—
1140	1	Gr	1	0.333	1.667	0.600	1
1141	2	Zr 1	1	0.333	1.667	0.600	1
1142	3	Zr 2	2	0.833	1.429	0.700	1
1143	4	Ts	3	2.167	1.259	0.794	2
1144	5	Dk 1	3	2.500	1.769	0.565	2
1145	6	Bn 1	2	0.700	1.123	0.891	2
1146	7	Tg	6	4.167	0.919	1.089	3
1147	8	Bd 1	1	0.333	2.177	0.459	3
1148	9	St 1	1	0.333	2.177	0.459	3
1149	10	Kw 1	5	3.250	0.851	1.176	3
1150	11	Rf 1	3	2.167	1.259	0.794	4
1151	12	Bd 2	1	0.167	1.327	0.754	4
1152	13	Kc	1	0.167	1.327	0.754	4
1153	14	St 2	1	0.167	1.327	0.754	4
1154	15	Bn 2	2	0.417	0.817	1.225	4
1155	16	Kw 2	4	2.033	0.749	1.336	4
1156	17	Bd 3	1	0.200	1.259	0.794	4
1157	18	Dk 2	1	0.200	1.259	0.794	4
1158	19	Dk 3	2	1.200	1.225	0.816	4
1159	20	Dk 4	1	0.333	1.667	0.600	5
1160	21	Dk 5	1	0.333	1.667	0.600	5
1161	22	Rf 2	3	2.250	1.089	0.918	5
1162	23	Vr	1	0.250	1.157	0.864	5
1163	24	St 3	1	0.500	1.633	0.612	5
1164	25	Dk 6	1	0.333	1.497	0.668	6
1165	26	Dk 7	1	0.333	1.497	0.668	6
1166	H102 KOK2		—	—	—	—	—
1167	1	Sg	1	0.250	2.081	0.480	1
1168	2	Zr 1	2	0.750	1.430	0.699	1
1169	3	Sr 1	4	3.000	1.665	0.601	2
1170	4	Zr 2	2	0.833	1.231	0.812	2
1171	5	Ms	1	0.250	2.081	0.480	3
1172	6	Bn 1	2	0.750	2.009	0.498	3
1173	7	Sr 2	3	1.333	1.068	0.936	3
1174	8	Rf 1	2	1.500	2.389	0.419	4
1175	9	Fr	2	0.533	1.050	0.953	4
1176	10	Bn 2	3	2.333	1.412	0.708	4
1177	11	Dk 2	1	0.500	2.805	0.356	5
1178	12	Tg	5	3.700	1.068	0.936	5
1179	13	Dk 3	1	0.333	1.828	0.547	5
1180	14	Dk 4	1	0.333	1.828	0.547	5
1181	15	Bd	1	0.200	1.484	0.674	6
1182	16	Bh	1	0.200	1.484	0.674	6
1183	17	Kc	1	0.200	1.484	0.674	6
1184	18	Rf 2	5	3.700	1.231	0.812	6
1185	19	Dk 5	1	0.200	1.647	0.607	7
1186	20	Dk 6	1	0.200	1.647	0.607	7
1187	21	Dk 7	1	0.200	1.647	0.607	7
1188	22	Bn 3	2	0.700	1.538	0.650	7
1189	23	Rf 3	2	1.000	1.882	0.531	8
1190	24	Dk 8	2	1.500	2.262	0.442	9
1191	25	Dk 9	1	0.500	2.679	0.373	10
1192	H45 KOK-3		—	—	—	—	—
1193	1	Zr 1	1	0.500	1.582	0.632	1
1194	2	Zr 2	2	1.167	0.904	1.106	2
1195	3	Tg	6	4.833	0.377	2.654	3
1196	4	Bd	1	0.167	1.055	0.948	4
1197	5	Kc	1	0.167	1.055	0.948	4
1198	6	Bn	3	1.667	0.603	1.659	4
1199	7	Dk 1	1	0.167	1.055	0.948	4
1200	8	Dk 2	1	0.167	1.055	0.948	4
1201	9	Rf	2	1.333	1.130	0.885	5
1202	10	Dk 3	1	0.333	1.281	0.781	5
1203	11	Dk 4	1	0.500	1.809	0.553	6
1204	H32 KOK-4		—	—	—	—	—
1205	1	Zr 1	1	0.500	2.545	0.393	1
1206	2	Zr 2	2	1.500	1.818	0.550	2
1207	3	Kg	2	1.000	1.273	0.786	3
1208	4	Zr 3	2	0.750	0.909	1.100	4
1209	5	Tg	4	2.833	0.727	1.375	5
1210	6	Kc	1	0.250	1.455	0.688	6
1211	7	Bd	1	0.250	1.455	0.688	6
1212	8	Rf	3	2.250	1.091	0.917	6
1213	9	Dk 1	1	0.333	1.818	0.550	7
1214	10	Dk 2	1	0.333	1.818	0.550	7

APPENDIX 18 (15):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1215	H158	KOK5	—	—	—	—	—
1216	1	Zr 1	2	1.000	1.386	0.722	1
1217	2	So	2	0.700	1.068	0.936	2
1218	3	Kg	2	0.700	1.068	0.936	2
1219	4	Ts 1	5	2.433	0.750	1.333	3
1220	5	Sr 1	3	2.200	1.050	0.952	4
1221	6	Dk 1	1	0.200	1.086	0.921	4
1222	7	Tg 1	10	8.400	0.538	1.857	4
1223	8	Bd 1	1	0.333	1.386	0.722	5
1224	9	Wk	1	0.333	1.386	0.722	5
1225	10	Dk 2	1	0.100	0.874	1.144	5
1226	11	Dk 3	1	0.100	0.874	1.144	5
1227	12	Dk 4	1	0.100	0.874	1.144	5
1228	13	Dk 5	1	0.100	0.874	1.144	5
1229	14	Dk 6	1	0.100	0.874	1.144	5
1230	15	Dk 7	1	0.100	0.874	1.144	5
1231	16	Dk 8	1	0.100	0.874	1.144	5
1232	17	Dk 9	1	0.100	0.874	1.144	5
1233	18	Tg 2	5	1.933	0.485	2.060	5
1234	19	Tg 3	6	5.200	0.733	1.365	6
1235	20	Rf 1	2	1.200	0.803	1.245	6
1236	21	Dk 10	1	0.200	0.821	1.218	6
1237	22	Ts 2	6	4.033	0.609	1.642	6
1238	23	Dk 11	1	0.167	1.068	0.936	7
1239	24	Dk 12	1	0.167	1.068	0.936	7
1240	25	Dk 13	1	0.167	1.068	0.936	7
1241	26	Dk 14	1	0.167	1.068	0.936	7
1242	27	Bd 2	1	0.167	1.068	0.936	7
1243	28	Dk 15	1	0.500	1.139	0.878	7
1244	29	Dk 16	1	0.167	0.944	1.059	7
1245	30	Dk 17	1	0.167	0.944	1.059	7
1246	31	Dk 18	1	0.167	0.944	1.059	7
1247	32	Rf 2	2	1.167	0.927	1.079	7
1248	33	Ts 3	3	0.917	0.838	1.193	7
1249	34	Dk 19	1	0.500	1.262	0.792	8
1250	35	Tg 4	4	3.333	1.121	0.892	8
1251	36	Sr 2	2	1.333	1.156	0.865	8
1252	37	Dk 20	1	0.250	1.456	0.687	9
1253	38	Dk 21	1	0.250	1.456	0.687	9
1254	39	Dk 22	1	0.250	1.456	0.687	9
1255	40	Dk 23	1	0.500	1.492	0.670	9
1256	H152	KMG1	—	—	—	—	—
1257	1	Zr	1	0.500	1.374	0.728	1
1258	2	Kg	2	1.200	1.055	0.948	2
1259	3	Ts 1	5	2.583	0.750	1.333	3
1260	4	Sr 1	4	1.600	0.802	1.247	4
1261	5	Rf 1	2	1.200	1.055	0.948	4
1262	6	Dk 1	1	0.200	1.070	0.935	4
1263	7	Sr 2	3	0.650	0.787	1.270	4
1264	8	Tg 1	5	3.750	1.047	0.955	5
1265	9	Dk 2	1	0.250	1.122	0.892	5
1266	10	Tg 2	5	3.250	0.973	1.028	5
1267	11	Dk 3	1	0.500	1.374	0.728	5
1268	12	Sr 3	4	2.533	0.928	1.077	5
1269	13	Tg 3	5	3.833	1.032	0.969	5
1270	14	Bd 1	1	0.200	1.367	0.732	6
1271	15	Dk 4	1	0.200	1.367	0.732	6
1272	16	Rf 2	2	1.200	1.352	0.740	6
1273	17	Dk 5	1	0.200	1.367	0.732	6
1274	18	Ts 2	2	0.533	1.218	0.821	6
1275	19	Dk 6	1	0.200	1.292	0.774	6
1276	20	Rf 3	2	1.200	1.278	0.783	6
1277	21	Dk 7	1	0.200	1.292	0.774	6
1278	22	Rd	1	0.250	1.248	0.801	6
1279	23	Rf 4	1	0.250	1.248	0.801	6
1280	24	Tg 4	5	3.500	1.114	0.898	6
1281	25	Kc 1	1	0.200	1.352	0.740	6
1282	26	Dk 8	1	0.200	1.352	0.740	6
1283	27	Rf 5	2	1.200	1.337	0.748	6
1284	28	Dk 9	1	0.200	1.352	0.740	6
1285	29	Dk 10	1	0.500	1.671	0.598	7
1286	30	Tg 5	3	1.833	1.478	0.677	7
1287	31	Dk 11	1	0.500	1.597	0.626	7
1288	32	Dk 12	1	0.200	1.433	0.698	7
1289	33	Kc 2	1	0.200	1.433	0.698	7
1290	34	Ts 3	4	2.200	1.359	0.736	7
1291	35	Tg 6	1	0.200	1.433	0.698	7
1292	36	Dk 13	1	0.500	1.656	0.604	7
1293	37	Bd 2	1	0.333	1.797	0.556	8
1294	38	Rf 6	3	2.333	1.768	0.566	8
1295	39	Rf 7	2	1.250	1.664	0.601	8
1296	40	Dk 14	1	0.250	1.679	0.596	8
1297	41	Rf 8	2	1.250	1.664	0.601	8
1298	42	Dk 15	1	0.333	2.087	0.479	9
1299	43	Dk 16	1	0.333	2.087	0.479	9
1300	44	Dk 17	1	0.500	1.983	0.504	9
1301	45	Dk 18	1	0.500	1.983	0.504	9

APPENDIX 18 (16):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1302	H159 KMG2		—	—	—	—	—
1303	1	Zr 1	2	0.393	0.968	1.033	1
1304	2	Zr 2	1	0.143	1.470	0.680	1
1305	3	Kg 1	4	1.476	0.752	1.329	2
1306	4	Tg 1	7	6.500	1.192	0.839	2
1307	5	Zr 3	2	0.500	0.942	1.062	3
1308	6	Sr 1	7	4.167	0.730	1.369	3
1309	7	Tg 2	3	1.450	0.950	1.052	3
1310	8	Dk 1	1	0.143	1.470	0.680	3
1311	9	Dk 2	1	0.143	1.470	0.680	3
1312	10	Ms	1	0.143	1.470	0.680	3
1313	11	Dk 3	1	0.143	1.470	0.680	3
1314	12	Dk 4	1	0.143	1.470	0.680	3
1315	13	Tg 3	4	2.250	1.140	0.878	4
1316	14	Sr 2	4	1.476	0.849	1.178	4
1317	15	Kg 2	3	1.393	0.955	1.047	4
1318	16	So 1	3	1.643	0.972	1.028	4
1319	17	Dk 5	1	0.143	1.008	0.992	4
1320	18	Dk 6	1	0.143	1.008	0.992	4
1321	19	Dk 7	1	0.143	1.008	0.992	4
1322	20	Bd 1	1	0.333	1.228	0.815	4
1323	21	Tg 4	5	3.167	1.166	0.858	4
1324	22	Rf 1	4	3.250	1.390	0.719	5
1325	23	Rf 2	2	0.583	1.390	0.719	5
1326	24	Bd 2	1	0.250	1.417	0.706	5
1327	25	Rf 3	2	1.250	1.118	0.895	5
1328	26	So 2	2	0.750	1.100	0.909	5
1329	27	So 3	3	1.750	1.030	0.971	5
1330	28	Bd 3	1	0.333	1.232	0.812	5
1331	29	Rf 4	4	2.833	1.197	0.836	5
1332	30	Dk 8	1	0.333	1.250	0.800	5
1333	31	Bn	2	0.833	1.232	0.812	5
1334	32	Dk 9	1	0.200	1.443	0.693	5
1335	33	Dk 10	1	0.200	1.443	0.693	5
1336	34	Rf 5	3	2.200	1.426	0.701	5
1337	35	Rf 6	2	1.200	1.434	0.697	5
1338	36	Dk 11	1	0.250	1.668	0.600	6
1339	37	Dk 12	1	0.250	1.668	0.600	6
1340	38	Dk 13	1	0.250	1.668	0.600	6
1341	39	Rf 7	3	2.500	1.650	0.606	6
1342	40	Dk 14	1	0.500	1.395	0.717	6
1343	41	So 4	2	1.000	1.360	0.736	6
1344	42	Dk 15	1	0.333	1.307	0.765	6
1345	43	Tg 5	2	0.583	1.228	0.815	6
1346	44	Dk 16	1	0.250	1.474	0.678	6
1347	45	Dk 17	1	0.250	1.474	0.678	6
1348	46	Tg 6	2	1.250	1.465	0.683	6
1349	47	Rf 8	2	1.500	1.500	0.667	6
1350	48	Dk 18	1	0.333	1.703	0.587	6
1351	49	Dk 19	1	0.333	1.703	0.587	6
1352	50	Dk 20	1	0.500	1.712	0.584	6
1353	51	Dk 21	1	0.333	1.927	0.519	7
1354	52	Dk 22	1	0.333	1.927	0.519	7
1355	53	Rf 9	2	1.500	1.628	0.614	7
1356	54	Rf 10	4	2.750	1.434	0.697	7
1357	55	Dk 23	1	0.500	1.742	0.574	7
1358	56	Dk 24	1	0.500	1.778	0.563	7
1359	57	Dk 25	1	0.500	1.905	0.525	8
1360	58	Dk 26	1	0.250	1.712	0.584	8
1361	59	Tg 7	4	2.250	1.668	0.600	8
1362	60	Dk 27	1	0.250	1.712	0.584	8
1363	61	Rf 11	2	1.250	1.936	0.517	9
1364	62	Rf 12	2	1.250	1.936	0.517	9
1365	63	Bd 4	1	0.250	1.945	0.514	9
1366	64	Dk 28	1	0.500	2.213	0.452	10
1367	65	Dk 29	1	0.500	2.213	0.452	10
1368	H38 KMG-3		—	—	—	—	—
1369	1	Zr 1	1	0.500	1.959	0.510	1
1370	2	Zr 2	2	1.500	1.281	0.781	2
1371	3	Kg	2	0.667	0.754	1.327	3
1372	4	Tg	6	4.833	0.377	2.654	4
1373	5	Bd	1	0.167	1.055	0.948	5
1374	6	Dk 1	1	0.167	1.055	0.948	5
1375	7	Kc	1	0.167	1.055	0.948	5
1376	8	Dk 2	1	0.167	1.055	0.948	5
1377	9	Rf	3	2.167	0.754	1.327	5
1378	10	Dk 3	1	0.333	1.432	0.698	6
1379	11	Dk 4	1	0.333	1.432	0.698	6
1380	H8 KMG-4		—	—	—	—	—
1381	1	Zr	1	0.500	2.552	0.392	1
1382	2	So	2	1.500	1.570	0.637	2
1383	3	Kg	2	0.833	0.981	1.019	3
1384	4	Tg	3	2.000	0.785	1.274	4
1385	5	Rf	2	1.333	1.374	0.728	5
1386	6	Bd	1	0.333	1.766	0.566	5
1387	7	Dk	1	0.500	2.355	0.425	5

APPENDIX 18 (17):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1388	H117 KMG5		–	–	–	–	–
1389	1	Zr 1	2	1.500	1.265	0.791	1
1390	2	Zr 2	2	0.667	0.770	1.299	2
1391	3	Sg	1	0.500	1.870	0.535	2
1392	4	Tg	6	3.833	0.385	2.598	3
1393	5	Rf 1	2	1.167	0.880	1.137	4
1394	6	Rf 2	3	2.167	0.770	1.299	4
1395	7	Kc	1	0.167	0.990	1.010	4
1396	8	Bd	1	0.167	0.990	1.010	4
1397	9	Rf 3	2	1.167	0.880	1.137	4
1398	10	Dk 1	1	0.500	1.485	0.674	5
1399	11	Dk 2	1	0.333	1.375	0.727	5
1400	12	Dk 3	1	0.333	1.375	0.727	5
1401	13	Dk 4	1	0.500	1.485	0.674	5
1402	H46 MGN-1		–	–	–	–	–
1403	1	Zr 1	1	0.500	1.851	0.540	1
1404	2	Zr 2	2	1.333	1.213	0.825	2
1405	3	So	3	1.250	0.702	1.424	3
1406	4	Ts	4	2.167	0.574	1.741	4
1407	5	Bn	2	1.333	1.213	0.825	4
1408	6	Rf	3	2.250	0.957	1.045	5
1409	7	Tg	2	1.250	1.085	0.922	5
1410	8	Bd	1	0.250	1.213	0.825	5
1411	9	Dk 1	1	0.500	1.851	0.540	5
1412	10	Dk 2	1	0.333	1.595	0.627	6
1413	11	Dk 3	1	0.333	1.595	0.627	6
1414	12	Kc	1	0.500	1.723	0.580	6
1415	H88 MGN-2		–	–	–	–	–
1416	1	Zr	1	0.500	1.723	0.580	1
1417	2	Sg	1	0.250	1.213	0.825	1
1418	3	Ts	2	1.200	1.085	0.922	2
1419	4	Rf 1	4	2.700	0.574	1.741	2
1420	5	Tg	5	3.750	0.574	1.741	3
1421	6	Dk 1	1	0.250	1.213	0.825	3
1422	7	Bn	2	0.750	0.957	1.045	3
1423	8	Kc	1	0.200	1.213	0.825	4
1424	9	Bd	1	0.200	1.213	0.825	4
1425	10	Ms	1	0.200	1.213	0.825	4
1426	11	Rf 2	2	1.500	1.468	0.681	4
1427	12	Dk 2	1	0.500	2.106	0.475	5
1428	H16 MGN-3		–	–	–	–	–
1429	1	Zr	1	0.250	1.450	0.690	1
1430	2	Ts	4	3.333	0.580	1.724	2
1431	3	Kc	1	0.250	1.450	0.690	3
1432	4	Tg	3	1.750	0.580	1.724	3
1433	5	Bd	1	0.250	1.450	0.690	3
1434	6	Rf	2	1.333	1.160	0.862	4
1435	7	Dk 1	1	0.333	1.450	0.690	4
1436	8	Dk 2	1	0.500	2.030	0.493	5
1437	H91 MGN-4		–	–	–	–	–
1438	1	Fl 1	3	2.333	1.252	0.799	1
1439	2	Zr 1	1	0.333	1.404	0.712	2
1440	3	Zr 2	3	1.533	0.873	1.146	2
1441	4	Dk 1	1	0.333	1.783	0.561	3
1442	5	Bd 1	1	0.333	1.783	0.561	3
1443	6	Tg	5	3.167	0.645	1.551	4
1444	7	Kc	1	0.200	1.176	0.850	5
1445	8	Bn	2	0.700	0.873	1.146	5
1446	9	Fl 2	3	2.200	1.024	0.976	5
1447	10	Bd 2	1	0.200	1.176	0.850	5
1448	11	Kw 1	2	0.833	1.176	0.850	6
1449	12	Dk 2	1	0.333	1.555	0.643	6
1450	13	Dk 3	1	0.333	1.555	0.643	6
1451	14	Fl 3	3	2.500	1.555	0.643	7
1452	15	Dk 4	1	0.333	2.086	0.479	8
1453	16	Kw 2	1	0.333	2.086	0.479	8
1454	H59 MGN-5		–	–	–	–	–
1455	1	Zr 1	1	0.500	2.090	0.479	1
1456	2	Ts	2	1.500	1.485	0.674	2
1457	3	Zr 2	2	0.700	0.990	1.010	3
1458	4	Tg 1	5	3.333	0.605	1.653	4
1459	5	Kc	1	0.200	1.210	0.827	5
1460	6	Rf 1	3	1.700	0.770	1.299	5
1461	7	Bn	2	1.200	1.100	0.909	5
1462	8	Bd 1	1	0.200	1.210	0.827	5
1463	9	Dk 1	1	0.333	1.375	0.727	6
1464	10	Tg 2	2	0.833	1.155	0.866	6
1465	11	Dk 2	1	0.500	1.705	0.587	6
1466	12	Rf 2	2	1.500	1.650	0.606	7
1467	13	Dk 3	1	0.500	2.255	0.444	8
1468	H33 SRF-1		–	–	–	–	–
1469	1	Zr 1	1	0.500	1.909	0.524	1
1470	2	Zr 2	2	1.333	1.182	0.846	2
1471	3	Sr	3	1.250	0.636	1.571	3
1472	4	Bn	2	1.333	1.182	0.846	4
1473	5	Tg	4	2.833	0.636	1.571	4
1474	6	Dk 1	1	0.500	1.909	0.524	5
1475	7	Rf	2	1.250	1.182	0.846	5
1476	8	Bd	1	0.250	1.364	0.733	5
1477	9	Dk 2	1	0.250	1.364	0.733	5
1478	10	Dk 3	1	0.500	1.909	0.524	6

APPENDIX 18 (18):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1479	H121 SRF-2		—	—	—	—	—
1480	1	Zr 1	1	0.333	1.393	0.718	1
1481	2	Zr 2	3	1.533	0.817	1.224	2
1482	3	Kg	3	1.833	0.817	1.224	3
1483	4	Tg 1	5	4.333	1.009	0.991	3
1484	5	Dk 1	1	0.333	1.393	0.718	4
1485	6	Zr 3	2	0.583	1.009	0.991	4
1486	7	Kc	1	0.200	1.586	0.631	4
1487	8	Bd 1	1	0.200	1.586	0.631	4
1488	9	Dk 2	1	0.200	1.586	0.631	4
1489	10	Dk 3	1	0.200	1.586	0.631	4
1490	11	Tg 2	4	3.500	1.297	0.771	5
1491	12	Dk 4	1	0.250	1.874	0.534	6
1492	13	Dk 5	1	0.250	1.874	0.534	6
1493	14	Bd 2	1	0.250	1.874	0.534	6
1494	H122 SRF-3		—	—	—	—	—
1495	1	Zr 1	2	1.000	1.190	0.841	1
1496	2	Zr 2	2	1.000	1.232	0.812	2
1497	3	Zr 3	2	0.750	1.232	0.812	2
1498	4	Zr 4	2	0.700	1.359	0.736	3
1499	5	Tg 1	4	2.833	1.359	0.736	3
1500	6	Tg 2	5	4.500	1.572	0.636	4
1501	7	Bd 1	1	0.250	1.912	0.523	4
1502	8	Dk 1	1	0.250	1.912	0.523	4
1503	9	Fl	3	2.250	1.742	0.574	4
1504	10	Dk 2	1	0.200	2.124	0.471	5
1505	11	Kc	1	0.200	2.124	0.471	5
1506	12	Bd 2	1	0.200	2.124	0.471	5
1507	13	Dk 3	1	0.200	2.124	0.471	5
1508	14	Dk 4	1	0.333	2.294	0.436	5
1509	15	Dk 5	1	0.333	2.294	0.436	5
1510	H39 SRF-4		—	—	—	—	—
1511	1	So	2	1.500	1.809	0.553	1
1512	2	Zr 1	2	1.000	1.281	0.781	2
1513	3	Sg	1	0.500	2.487	0.402	2
1514	4	Zr 2	2	0.750	0.904	1.106	3
1515	5	Tg	4	2.333	0.678	1.475	4
1516	6	Kc	1	0.250	1.356	0.737	5
1517	7	Rf	3	2.250	1.055	0.948	5
1518	8	Ts	2	1.250	1.206	0.829	5
1519	9	Dk 1	1	0.333	1.733	0.577	6
1520	10	Dk 2	1	0.333	1.733	0.577	6
1521	11	Bd	1	0.500	1.884	0.531	6
1522	H6 SRF-5		—	—	—	—	—
1523	1	Zr 1	1	0.500	2.292	0.436	1
1524	2	Ts	2	1.333	1.146	0.873	2
1525	3	Tg	3	2.000	0.573	1.745	3
1526	4	Bd	1	0.333	1.719	0.582	4
1527	5	Rf	2	1.333	1.146	0.873	4
1528	6	Dk	1	0.500	2.292	0.436	5
1529	H141 TNF-1		—	—	—	—	—
1530	1	Zr	2	1.000	1.305	0.766	1
1531	2	So	2	0.667	0.725	1.379	2
1532	3	Kd	2	0.667	0.725	1.379	2
1533	4	Tg	6	5.000	0.145	6.896	3
1534	5	Bd	1	0.167	1.015	0.985	4
1535	6	Dk 1	1	0.167	1.015	0.985	4
1536	7	Dk 2	1	0.167	1.015	0.985	4
1537	8	Dk 3	1	0.167	1.015	0.985	4
1538	H84b TNF-2		—	—	—	—	—
1539	1	Kg	1	0.500	1.838	0.544	1
1540	2	Zr 1	2	1.500	1.457	0.686	2
1541	3	Zr 2	2	1.000	1.103	0.907	3
1542	4	Sr	2	0.643	0.776	1.289	4
1543	5	Tg 1	7	3.783	0.476	2.099	5
1544	6	Rf 1	3	2.143	0.803	1.245	6
1545	7	Dk 1	1	0.143	0.858	1.166	6
1546	8	Tg 2	4	1.810	0.640	1.563	6
1547	9	Tg 3	5	4.143	0.749	1.336	6
1548	10	Kf	1	0.143	0.858	1.166	6
1549	11	Ts	2	0.343	0.722	1.386	6
1550	12	Dk 2	1	0.333	1.184	0.844	7
1551	13	Dk 3	1	0.333	1.184	0.844	7
1552	14	Bn	3	1.750	0.939	1.065	7
1553	15	Bd 1	1	0.250	1.021	0.979	7
1554	16	Rf 2	3	2.250	0.967	1.035	7
1555	17	Dk 4	1	0.200	1.130	0.885	7
1556	18	Dk 5	1	0.200	1.130	0.885	7
1557	19	Dk 6	1	0.200	1.130	0.885	7
1558	20	Dk 7	1	0.200	1.130	0.885	7
1559	21	Tg 4	5	4.500	0.994	1.006	7
1560	22	Kw	1	0.333	1.321	0.757	8
1561	23	Rf 3	2	1.333	1.293	0.773	8
1562	24	Dk 8	1	0.333	1.348	0.742	8
1563	25	Dk 9	1	0.333	1.348	0.742	8
1564	26	Bd 2	1	0.200	1.375	0.727	8
1565	27	Dk 10	1	0.200	1.375	0.727	8
1566	28	Dk 11	1	0.200	1.375	0.727	8
1567	29	Dk 12	1	0.200	1.375	0.727	8
1568	30	Dk 13	1	0.500	1.675	0.597	9

APPENDIX 18 (19):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr	RRA	1/X RRA	Depth
1569	H70 TNF-3		—	—	—	—	—
1570	1	Zr 1	1	0.333	2.084	0.480	1
1571	2	Kg	3	1.833	1.572	0.636	2
1572	3	Tg 1	3	1.833	1.879	0.532	3
1573	4	Zr 2	2	0.833	1.401	0.714	3
1574	5	Rf 1	2	1.333	2.323	0.430	4
1575	6	Bd 1	1	0.333	2.391	0.418	4
1576	7	Zr 3	2	1.000	1.298	0.770	4
1577	8	Dk 1	1	0.500	2.836	0.353	5
1578	9	Zr 4	2	1.000	1.264	0.791	5
1579	10	So	2	0.700	1.298	0.770	6
1580	11	Tg 2	5	3.833	1.401	0.714	7
1581	12	Rf 2	3	2.200	1.776	0.563	8
1582	13	Wk	1	0.200	1.913	0.523	8
1583	14	Ms	1	0.200	1.913	0.523	8
1584	15	Kc	1	0.200	1.913	0.523	8
1585	16	Dk 2	1	0.333	2.289	0.437	9
1586	17	Dk 3	1	0.333	2.289	0.437	9
1587	H48 TNF-4		—	—	—	—	—
1588	1	Kg	1	0.500	2.680	0.373	1
1589	2	Zr 1	2	1.500	2.042	0.490	2
1590	3	Zr 2	2	1.000	1.532	0.653	3
1591	4	Zr 3	2	0.833	1.149	0.871	4
1592	5	Tg	3	1.750	0.893	1.119	5
1593	6	Bd	1	0.333	1.532	0.653	6
1594	7	Rf 1	4	2.833	0.893	1.119	6
1595	8	Dk 1	1	0.250	1.532	0.653	7
1596	9	Dk 2	1	0.250	1.532	0.653	7
1597	10	Bn	2	0.750	1.276	0.783	7
1598	11	Rf 2	2	1.500	1.787	0.560	8
1599	12	Dk 3	1	0.500	2.425	0.412	9
1600	H94 TNF-5		—	—	—	—	—
1601	1	Sg	1	0.333	1.457	0.687	1
1602	2	Zr 1	3	1.500	0.961	1.041	1
1603	3	Zr 2	4	1.833	0.713	1.403	2
1604	4	Zr 3	4	1.583	0.837	1.195	2
1605	5	Kg	4	2.583	0.775	1.291	3
1606	6	Dk 1	1	0.250	1.209	0.827	3
1607	7	Bn	2	0.750	1.209	0.827	3
1608	8	Rf 1	2	1.250	1.271	0.787	3
1609	9	Tg	3	1.583	1.023	0.978	4
1610	10	Kc	1	0.250	1.271	0.787	4
1611	11	Bd	1	0.250	1.271	0.787	4
1612	12	Rf 2	2	1.500	1.643	0.609	4
1613	13	Dk 2	1	0.500	1.767	0.566	4
1614	14	Dk 3	1	0.333	1.519	0.658	5
1615	15	Ts	3	2.333	1.395	0.717	5
1616	16	Dk 4	1	0.500	2.138	0.468	5
1617	17	Dk 5	1	0.333	1.891	0.529	6
1618	18	Dk 6	1	0.333	1.891	0.529	6
1619	H108 ZBR-1		—	—	—	—	—
1620	1	Zr 1	1	0.500	2.593	0.386	1
1621	2	Zr 2	2	1.500	1.804	0.554	2
1622	3	So 1	2	1.000	1.240	0.806	3
1623	4	So 2	2	0.750	0.902	1.109	4
1624	5	Tg	4	3.000	0.789	1.267	5
1625	6	Dk 1	1	0.250	1.578	0.634	6
1626	7	Bd	1	0.250	1.578	0.634	6
1627	8	Rf	2	1.250	1.353	0.739	6
1628	9	Dk 2	1	0.500	2.142	0.467	7
1629	H62 ZBR-2		—	—	—	—	—
1630	1	Zr 1	1	0.500	2.167	0.462	1
1631	2	So 1	2	1.500	1.614	0.619	2
1632	3	So 2	2	0.833	1.147	0.872	3
1633	4	Ts	3	1.333	0.765	1.308	4
1634	5	Bn	2	0.667	1.062	0.942	5
1635	6	Tg	3	1.083	0.807	1.239	5
1636	7	Rf 1	3	2.500	1.444	0.692	6
1637	8	Rf 2	4	3.333	1.105	0.905	6
1638	9	Bd 1	2	1.333	1.275	0.785	6
1639	10	Dk 1	1	0.333	1.997	0.501	7
1640	11	Dk 2	1	0.333	1.997	0.501	7
1641	12	Dk 3	1	0.250	1.657	0.604	7
1642	13	Dk 4	1	0.250	1.657	0.604	7
1643	14	Dk 5	1	0.250	1.657	0.604	7
1644	15	Bd 2	1	0.500	1.827	0.547	7
1645	H78 ZBR-3		—	—	—	—	—
1646	1	Zr 1	1	0.143	1.221	0.819	1
1647	2	Tg 1	7	5.500	0.753	1.327	2
1648	3	Bd	2	1.143	1.169	0.855	3
1649	4	Dk 1	1	0.143	1.221	0.819	3
1650	5	Ts	2	0.393	0.805	1.242	3
1651	6	Dk 2	1	0.143	1.221	0.819	3
1652	7	Bn 1	2	0.643	1.065	0.939	3
1653	8	Dk 3	1	0.143	1.221	0.819	3
1654	9	Ms	1	0.500	1.637	0.611	4
1655	10	Tg 2	4	2.500	0.909	1.100	4
1656	11	Rf 1	2	1.000	1.429	0.700	4
1657	12	Bn 2	2	0.750	1.221	0.819	5
1658	13	Dk 4	1	0.250	1.377	0.726	5
1659	14	Rf 2	2	1.250	1.325	0.755	5
1660	15	Dk 5	2	1.500	1.845	0.542	5
1661	16	Rf 3	2	1.000	1.585	0.631	6
1662	17	Dk 6	1	0.500	1.793	0.558	6
1663	18	Dk 7	1	0.500	2.312	0.432	6
1664	19	Dk 8	2	1.500	2.001	0.500	7
1665	20	Dk 9	1	0.500	2.468	0.405	8

APPENDIX 18 (20):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1666	H128 ZBR-4		—	—	—	—	—
1667	1	Zr	1	0.333	1.295	0.772	1
1668	2	Kg	3	1.833	0.839	1.192	2
1669	3	So 1	2	0.500	0.863	1.159	3
1670	4	So 2	3	1.033	0.911	1.098	3
1671	5	Tg 1	6	4.000	0.935	1.070	4
1672	6	Tg 2	2	0.833	1.271	0.787	4
1673	7	Rf 1	5	4.333	1.175	0.851	4
1674	8	Rf 2	2	1.167	1.343	0.745	5
1675	9	Rf 3	2	1.167	1.343	0.745	5
1676	10	Rf 4	2	1.167	1.343	0.745	5
1677	11	Dk 1	1	0.167	1.390	0.719	5
1678	12	Ms	1	0.167	1.390	0.719	5
1679	13	Rf 5	2	1.500	1.678	0.596	5
1680	14	Dk 2	1	0.200	1.630	0.613	5
1681	15	Dk 3	1	0.200	1.630	0.613	5
1682	16	Dk 4	1	0.200	1.630	0.613	5
1683	17	Bd	1	0.200	1.630	0.613	5
1684	18	Dk 5	1	0.500	1.798	0.556	6
1685	19	Dk 6	1	0.500	1.798	0.556	6
1686	20	Dk 7	1	0.500	1.798	0.556	6
1687	21	Dk 8	1	0.500	2.134	0.469	6
1688	H116 ZBR-5		—	—	—	—	—
1689	1	Zr 1	1	0.500	1.468	0.681	1
1690	2	Zr 2	2	1.167	0.830	1.205	2
1691	3	Tg	6	4.250	0.319	3.134	3
1692	4	Rf 1	4	3.167	0.574	1.741	4
1693	5	Dk 1	1	0.167	0.957	1.045	4
1694	6	Ms	1	0.167	0.957	1.045	4
1695	7	Dk 2	1	0.167	0.957	1.045	4
1696	8	Rf 2	2	1.167	0.830	1.205	4
1697	9	Dk 3	1	0.250	1.213	0.825	5
1698	10	Dk 4	1	0.250	1.213	0.825	5
1699	11	Dk 5	1	0.250	1.213	0.825	5
1700	12	Dk 6	1	0.500	1.468	0.681	5
1701	H7 ADK-1		—	—	—	—	—
1702	1	Zr 1	1	0.500	2.159	0.463	1
1703	2	Zr 2	2	1.333	1.178	0.849	2
1704	3	Tg 1	3	1.833	0.589	1.698	3
1705	4	Bd	1	0.333	1.570	0.637	4
1706	5	Tg 2	3	2.333	0.785	1.274	4
1707	6	Dk 1	1	0.333	1.766	0.566	5
1708	7	Dk 2	1	0.333	1.766	0.566	5
1709	H90 ADK-2		—	—	—	—	—
1710	1	Sg	1	0.500	1.784	0.560	1
1711	2	So 1	2	1.333	1.232	0.812	1
1712	3	So 2	3	1.700	0.765	1.308	2
1713	4	Dk 1	1	0.333	1.317	0.759	3
1714	5	Tg 1	5	2.917	0.467	2.140	3
1715	6	Rf 1	4	3.200	0.765	1.308	4
1716	7	Kc	1	0.200	1.020	0.981	4
1717	8	Dk 2	1	0.200	1.020	0.981	4
1718	9	Tg 2	3	1.700	0.765	1.308	4
1719	10	Dk 3	1	0.250	1.317	0.759	5
1720	11	Dk 4	1	0.250	1.317	0.759	5
1721	12	Dk 5	1	0.250	1.317	0.759	5
1722	13	Rf 2	2	1.333	1.232	0.812	5
1723	14	Bd	1	0.333	1.317	0.759	5
1724	15	Dk 6	1	0.500	1.784	0.560	6
1725	H18 ADK-3		—	—	—	—	—
1726	1	Kg	1	0.500	1.916	0.522	1
1727	2	Zr	2	1.333	1.127	0.887	2
1728	3	Ts	3	1.250	0.564	1.774	3
1729	4	Rf	2	1.333	1.127	0.887	4
1730	5	Tg	4	3.333	0.676	1.478	4
1731	6	Dk 1	1	0.500	1.916	0.522	5
1732	7	Kc	1	0.250	1.466	0.682	5
1733	8	Ms	1	0.250	1.466	0.682	5
1734	9	Dk 2	1	0.250	1.466	0.682	5
1735	H146 ADK4		—	—	—	—	—
1736	1	Zr	1	0.333	1.365	0.733	1
1737	2	Kg 1	3	1.583	0.931	1.075	2
1738	3	Ts	3	2.333	1.282	0.780	3
1739	4	Kg 2	4	1.917	0.662	1.511	3
1740	5	Dk 1	1	0.333	1.716	0.583	4
1741	6	Bd 1	1	0.333	1.716	0.583	4
1742	7	Tg 1	4	2.750	0.931	1.075	4
1743	8	Sr 1	3	0.833	0.682	1.465	4
1744	9	Rf 1	1	0.250	1.096	0.912	4
1745	10	Rf 2	2	1.250	1.324	0.756	5
1746	11	Dk 2	1	0.250	1.365	0.733	5
1747	12	Ms 1	1	0.250	1.365	0.733	5
1748	13	Tg 2	4	2.833	0.951	1.051	5
1749	14	Tg 3	3	1.667	0.951	1.051	5
1750	15	Dk 3	1	0.500	1.758	0.569	6
1751	16	Rf 3	2	1.250	1.344	0.744	6
1752	17	Dk 4	1	0.250	1.386	0.722	6
1753	18	Bd 2	1	0.250	1.386	0.722	6
1754	19	Rf 4	3	2.333	1.303	0.768	6
1755	20	Ms 2	1	0.333	1.386	0.722	6
1756	21	Dk 5	1	0.500	1.778	0.562	7
1757	22	Dk 6	1	0.333	1.737	0.576	7
1758	23	Dk 7	1	0.333	1.737	0.576	7

APPENDIX 18 (21):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1759	H143 ADK5		—	—	—	—	—
1760	1	Zr	1	0.500	1.811	0.552	1
1761	2	So	2	1.250	1.298	0.770	2
1762	3	Kg	4	2.833	0.854	1.171	3
1763	4	Bd	1	0.250	1.367	0.732	4
1764	5	Tg 1	3	0.950	0.615	1.626	4
1765	6	Dk 1	1	0.250	1.367	0.732	4
1766	7	Rf 1	2	1.333	1.059	0.944	5
1767	8	Tg 2	5	2.333	0.581	1.722	5
1768	9	Dk 2	1	0.500	1.572	0.636	6
1769	10	Rf 2	2	1.200	1.025	0.976	6
1770	11	Rf 3	2	1.200	1.025	0.976	6
1771	12	Rf 4	2	1.200	1.025	0.976	6
1772	13	Rf 5	2	1.200	1.025	0.976	6
1773	14	Dk 3	1	0.500	1.537	0.650	7
1774	15	Dk 4	1	0.500	1.537	0.650	7
1775	16	Dk 5	1	0.500	1.537	0.650	7
1776	17	Dk 6	1	0.500	1.537	0.650	7
1777	H111 CDY1		—	—	—	—	—
1778	1	Zr 1	1	0.500	2.487	0.402	1
1779	2	Zr 2	2	1.500	1.809	0.553	2
1780	3	Zr 3	2	0.833	1.281	0.781	3
1781	4	Tg	3	1.833	0.904	1.106	4
1782	5	Bd	1	0.333	1.582	0.632	5
1783	6	Rf 1	3	1.333	0.829	1.206	5
1784	7	Bn	2	0.833	1.206	0.829	6
1785	8	Rf 2	2	1.333	1.356	0.737	6
1786	9	Rf 3	2	1.500	1.733	0.577	7
1787	10	Dk 1	1	0.500	2.035	0.492	7
1788	11	Dk 2	1	0.500	2.411	0.415	8
1789	H28 CDY-2		—	—	—	—	—
1790	1	Zr 1	1	0.500	1.818	0.550	1
1791	2	Zr 2	2	1.250	1.091	0.917	2
1792	3	Tg	4	2.333	0.545	1.833	3
1793	4	Rf 1	3	2.250	0.909	1.100	4
1794	5	Bd	1	0.250	1.273	0.786	4
1795	6	Bn	2	0.750	0.909	1.100	4
1796	7	Dk 1	1	0.333	1.636	0.611	5
1797	8	Dk 2	1	0.333	1.636	0.611	5
1798	9	Rf 2	2	1.500	1.455	0.688	5
1799	10	Dk 3	1	0.500	2.182	0.458	6
1800	H51 CDY-3		—	—	—	—	—
1801	1	Zr 1	1	0.500	2.310	0.433	1
1802	2	Zr 2	2	1.500	1.705	0.587	2
1803	3	Zr 3	2	1.000	1.210	0.827	3
1804	4	Zr 4	2	0.700	0.825	1.212	4
1805	5	Tg	5	3.250	0.550	1.819	5
1806	6	Kc	1	0.200	1.155	0.866	6
1807	7	Rf 1	4	3.200	0.825	1.212	6
1808	8	Bd	1	0.200	1.155	0.866	6
1809	9	Rf 2	2	1.200	1.045	0.957	6
1810	10	Dk 1	1	0.250	1.430	0.699	7
1811	11	Dk 2	1	0.250	1.430	0.699	7
1812	12	Dk 3	1	0.250	1.430	0.699	7
1813	13	Dk 4	1	0.500	1.650	0.606	7
1814	H114 CDY4		—	—	—	—	—
1815	1	Zr 1	1	0.333	2.106	0.475	1
1816	2	Zr 2	3	2.500	1.468	0.681	2
1817	3	Dk 1	1	0.333	2.106	0.475	3
1818	4	Zr 3	2	0.833	1.085	0.922	3
1819	5	Zr 4	2	0.700	0.830	1.205	4
1820	6	Tg	5	3.500	0.702	1.424	5
1821	7	Bd	1	0.200	1.340	0.746	6
1822	8	Kc	1	0.200	1.340	0.746	6
1823	9	Rf 1	2	1.200	1.213	0.825	6
1824	10	Rf 2	2	1.200	1.213	0.825	6
1825	11	Dk 2	1	0.500	1.851	0.540	7
1826	12	Dk 3	1	0.500	1.851	0.540	7
1827	H120 CDY5		—	—	—	—	—
1828	1	Zr	1	0.125	0.865	1.156	1
1829	2	Tg	8	6.333	0.288	3.468	2
1830	3	Ms	1	0.125	0.865	1.156	3
1831	4	Dk 1	1	0.125	0.865	1.156	3
1832	5	Rf 1	2	1.125	0.769	1.301	3
1833	6	Rf 2	3	1.625	0.577	1.734	3
1834	7	Kc	1	0.125	0.865	1.156	3
1835	8	Tt	1	0.125	0.865	1.156	3
1836	9	Bn	2	1.125	0.769	1.301	3
1837	10	Dk 2	1	0.500	1.345	0.743	4
1838	11	Dk 3	2	1.333	1.057	0.946	4
1839	12	Dk 4	1	0.333	1.153	0.867	4
1840	13	Dk 5	1	0.500	1.345	0.743	4
1841	14	Dk 6	1	0.500	1.634	0.612	5
1842	H13 DAL-1		—	—	—	—	—
1843	1	Zr 1	1	0.333	1.450	0.690	1
1844	2	Zr 2	3	2.200	0.580	1.724	2
1845	3	Sg	1	0.333	1.450	0.690	3
1846	4	Tg	5	4.333	0.290	3.448	3
1847	5	Bd	1	0.200	1.160	0.862	4
1848	6	Dk 1	1	0.200	1.160	0.862	4
1849	7	Dk 2	1	0.200	1.160	0.862	4
1850	8	Dk 3	1	0.200	1.160	0.862	4

APPENDIX 18 (22):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1851	H131 DAL-2		–	–	–	–	–
1852	1	Fr	2	1.000	1.640	0.610	1
1853	2	Zr 1	2	1.000	1.521	0.657	2
1854	3	Zr 2	2	1.000	1.778	0.563	2
1855	4	So 1	2	0.833	1.420	0.704	3
1856	5	So 2	2	0.833	1.933	0.517	3
1857	6	So 3	3	1.333	1.338	0.747	4
1858	7	So 4	3	1.333	2.108	0.474	4
1859	8	Bn 1	3	1.833	1.622	0.617	5
1860	9	So 5	2	0.533	1.347	0.742	5
1861	10	Bn 2	2	0.667	2.392	0.418	5
1862	11	Tg 1	3	1.667	2.373	0.421	5
1863	12	Rf 1	2	1.333	1.943	0.515	6
1864	13	Dk 1	1	0.333	1.961	0.510	6
1865	14	Tg 2	5	2.833	1.374	0.728	6
1866	15	Rf 2	3	2.500	2.694	0.371	6
1867	16	Rf 3	3	2.333	2.676	0.374	6
1868	17	Bd 1	1	0.333	2.712	0.369	6
1869	18	Dk 2	1	0.500	2.282	0.438	7
1870	19	Bd 2	1	0.200	1.713	0.584	7
1871	20	Rf 4	2	1.200	1.695	0.590	7
1872	21	Sr	2	1.200	1.695	0.590	7
1873	22	Ts	3	0.950	1.512	0.661	7
1874	23	Dk 3	1	0.333	3.033	0.330	7
1875	24	Dk 4	1	0.333	3.033	0.330	7
1876	25	Dk 5	1	0.333	3.015	0.332	7
1877	26	Dk 6	1	0.333	3.015	0.332	7
1878	27	Dk 7	1	0.500	2.034	0.492	8
1879	28	Bd 3	1	0.500	2.034	0.492	8
1880	29	Bn 3	2	0.833	1.814	0.551	8
1881	30	Tg 3	4	2.533	1.723	0.580	8
1882	31	Rf 5	2	1.500	2.135	0.468	9
1883	32	Bd 3	1	0.250	2.062	0.485	9
1884	33	Dk 8	1	0.250	2.062	0.485	9
1885	34	Rf 6	5	4.250	1.988	0.503	9
1886	35	Dk 9	1	0.500	2.474	0.404	10
1887	36	Dk 10	1	0.200	2.327	0.430	10
1888	37	Dk 11	1	0.200	2.327	0.430	10
1889	38	Dk 12	1	0.200	2.327	0.430	10
1890	39	Dk 13	1	0.200	2.327	0.430	10
1891	H112 DAL-3		–	–	–	–	–
1892	1	Zr 1	1	0.500	1.959	0.510	1
1893	2	Zr 2	2	1.500	1.281	0.781	2
1894	3	Zr 3	2	0.667	0.754	1.327	3
1895	4	Tg 1	6	4.833	0.377	2.654	4
1896	5	Tg 2	3	2.167	0.754	1.327	5
1897	6	Bd	1	0.167	1.055	0.948	5
1898	7	Dk 1	1	0.167	1.055	0.948	5
1899	8	Dk 2	1	0.167	1.055	0.948	5
1900	9	Dk 3	1	0.167	1.055	0.948	5
1901	10	Dk 4	1	0.333	1.432	0.698	6
1902	11	Ms	1	0.333	1.432	0.698	6
1903	H14 DAL-4		–	–	–	–	–
1904	1	Zr 1	1	0.500	2.465	0.406	1
1905	2	So	2	1.500	1.595	0.627	2
1906	3	Zr 2	2	0.833	1.015	0.985	3
1907	4	Tg	3	1.833	0.725	1.379	4
1908	5	Rf	3	2.333	1.015	0.985	5
1909	6	Ms	1	0.333	1.595	0.627	5
1910	7	Dk 1	1	0.333	1.885	0.530	6
1911	8	Dk 2	1	0.333	1.885	0.530	6
1912	H15 DAL-5		–	–	–	–	–
1913	1	Zr 1	1	0.500	1.885	0.530	1
1914	2	Zr 2	2	1.250	1.015	0.985	2
1915	3	Tg	4	2.833	0.435	2.299	3
1916	4	Rf	3	2.250	0.725	1.379	4
1917	5	Kc	1	0.250	1.305	0.766	4
1918	6	Bd	1	0.250	1.305	0.766	4
1919	7	Dk 1	1	0.333	1.595	0.627	5
1920	8	Dk 2	1	0.333	1.595	0.627	5
1921	H3 DNL-1		–	–	–	–	–
1922	1	Zr 1	1	0.500	2.000	0.500	1
1923	2	Zr 2	2	1.333	1.273	0.786	2
1924	3	So	3	1.333	0.727	1.375	3
1925	4	Bn	2	0.833	1.091	0.917	4
1926	5	Tg 1	3	1.833	0.909	1.100	4
1927	6	Rf	2	1.500	1.636	0.611	5
1928	7	Dk 1	1	0.333	1.636	0.611	5
1929	8	Tg 2	2	1.333	1.455	0.688	5
1930	9	Dk 2	1	0.500	2.364	0.423	6
1931	10	Bd	1	0.500	2.182	0.458	6

APPENDIX 18(23):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
1932	H36 DNL-2		—	—	—	—	—
1933	1	Zr 1	1	0.500	1.884	0.531	1
1934	2	Zr 2	2	1.333	1.206	0.829	2
1935	3	So	3	1.250	0.678	1.475	3
1936	4	Bn	2	0.833	1.055	0.948	4
1937	5	Tg	4	2.833	0.754	1.327	4
1938	6	Rf 1	2	1.500	1.582	0.632	5
1939	7	Rf 2	2	1.250	1.281	0.781	5
1940	8	Bd	1	0.250	1.432	0.698	5
1941	9	Ms	1	0.250	1.432	0.698	5
1942	10	Dk 1	1	0.500	2.261	0.442	6
1943	11	Dk 2	1	0.500	1.959	0.510	6
1944	H29 DNL-3		—	—	—	—	—
1945	1	Zr 1	1	0.500	2.818	0.355	1
1946	2	Zr 2	2	1.500	2.091	0.478	2
1947	3	Kg 1	2	1.000	1.545	0.647	3
1948	4	Kg 2	2	1.000	1.182	0.846	4
1949	5	Sr	2	0.750	1.000	1.000	5
1950	6	Tg	4	3.000	1.000	1.000	6
1951	7	Dk 1	1	0.250	1.727	0.579	7
1952	8	Rf	2	1.250	1.545	0.647	7
1953	9	Bd	1	0.250	1.727	0.579	7
1954	10	Dk 2	1	0.500	2.273	0.440	8
1955	H74 DNL-4		—	—	—	—	—
1956	1	Zr 1	2	1.333	1.471	0.680	1
1957	2	So 1	3	1.500	1.047	0.955	2
1958	3	Sg	1	0.500	1.952	0.512	2
1959	4	So 2	2	0.583	0.962	1.039	3
1960	5	So 3	2	0.583	1.302	0.768	3
1961	6	So 4	4	2.750	0.934	1.071	4
1962	7	Tg 1	4	3.500	1.613	0.620	4
1963	8	Tg 2	4	2.250	1.075	0.930	5
1964	9	Dk 1	1	0.250	1.415	0.707	5
1965	10	Dk 2	1	0.250	1.415	0.707	5
1966	11	Dk 3	1	0.250	2.094	0.478	5
1967	12	Dk 4	1	0.250	2.094	0.478	5
1968	13	Bd	1	0.250	2.094	0.478	5
1969	14	Rf 1	2	1.250	1.500	0.667	6
1970	15	Bn	2	0.750	1.443	0.693	6
1971	16	Ms	1	0.250	1.556	0.643	6
1972	17	Dk 5	1	0.500	1.981	0.505	7
1973	18	Rf 2	2	1.500	1.868	0.535	7
1974	19	Dk 6	1	0.500	2.349	0.426	8
1975	H127 DNL-5		—	—	—	—	—
1976	1	Zr	1	0.500	1.798	0.556	1
1977	2	So 1	2	1.333	1.302	0.768	2
1978	3	So 2	3	1.333	0.868	1.152	3
1979	4	Bn	2	0.833	1.240	0.807	4
1980	5	So 3	3	1.033	0.682	1.467	4
1981	6	Rf 1	2	1.500	1.674	0.598	5
1982	7	Rf 2	2	1.333	1.116	0.896	5
1983	8	Tg	5	3.533	0.682	1.467	5
1984	9	Dk 1	1	0.500	2.169	0.461	6
1985	10	Dk 2	1	0.500	1.612	0.621	6
1986	11	Rf 3	5	4.200	0.930	1.076	6
1987	12	Kc	1	0.200	1.178	0.849	6
1988	13	Ms	1	0.200	1.178	0.849	6
1989	14	Bd	1	0.200	1.178	0.849	6
1990	15	Dk 3	1	0.200	1.426	0.701	7
1991	16	Dk 4	1	0.200	1.426	0.701	7
1992	17	Dk 5	1	0.200	1.426	0.701	7
1993	18	Dk 6	1	0.200	1.426	0.701	7
1994	H96 DKR-1		—	—	—	—	—
1995	1	Zr	2	1.500	2.111	0.474	1
1996	2	So 1	2	1.000	1.711	0.584	1
1997	3	Dk 1	1	0.500	2.555	0.391	2
1998	4	So 2	2	1.000	1.356	0.738	2
1999	5	So 3	2	0.833	1.044	0.957	3
2000	6	Ts	3	1.643	0.778	1.286	4
2001	7	Tg	7	5.033	0.600	1.667	5
2002	8	Dk 2	1	0.333	1.222	0.818	5
2003	9	Bn	2	0.393	0.867	1.154	6
2004	10	Dk 3	1	0.143	1.044	0.957	6
2005	11	Dk 4	1	0.143	1.044	0.957	6
2006	12	Bd	1	0.143	1.044	0.957	6
2007	13	Kc	1	0.143	1.044	0.957	6
2008	14	Rf 1	5	4.143	0.867	1.154	6
2009	15	Rf 2	4	3.500	1.178	0.849	7
2010	16	Dk 5	1	0.200	1.311	0.763	7
2011	17	Dk 6	1	0.200	1.311	0.763	7
2012	18	Dk 7	1	0.200	1.311	0.763	7
2013	19	Dk 8	1	0.200	1.311	0.763	7
2014	20	Dk 9	1	0.250	1.622	0.616	8
2015	21	Dk 10	1	0.250	1.622	0.616	8
2016	22	Dk 11	1	0.250	1.622	0.616	8

APPENDIX 18 (24):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2017	H142 DKR2		—	—	—	—	—
2018	1	Zr	2	0.833	1.057	0.946	1
2019	2	Sg	1	0.500	2.114	0.473	1
2020	3	Sr	3	1.200	0.673	1.487	2
2021	4	So	2	1.500	1.538	0.650	2
2022	5	Bn	2	0.833	1.057	0.946	3
2023	6	Tg	5	3.667	0.673	1.487	3
2024	7	Rf 1	2	1.500	1.538	0.650	4
2025	8	Dk 1	1	0.200	1.249	0.800	4
2026	9	Kc	1	0.200	1.249	0.800	4
2027	10	Bd	1	0.200	1.249	0.800	4
2028	11	Rf 2	3	2.200	1.057	0.946	4
2029	12	Dk 2	1	0.500	2.114	0.473	5
2030	13	Dk 3	1	0.333	1.634	0.612	5
2031	14	Dk 4	1	0.333	1.634	0.612	5
2032	H140 DKR3		—	—	—	—	—
2033	1	Zr 1	1	0.500	1.395	0.717	1
2034	2	Zr 2	2	1.200	0.899	1.113	2
2035	3	Tg 1	5	2.500	0.465	2.151	3
2036	4	Rf 1	2	1.200	0.899	1.113	4
2037	5	Kc	1	0.200	0.961	1.041	4
2038	6	Rf 2	3	2.200	0.837	1.195	4
2039	7	Tg 2	6	3.700	0.465	2.151	4
2040	8	Dk 1	1	0.500	1.395	0.717	5
2041	9	Dk 2	1	0.333	1.333	0.750	5
2042	10	Dk 3	1	0.333	1.333	0.750	5
2043	11	Bd 1	1	0.167	0.961	1.041	5
2044	12	Bd 2	1	0.167	0.961	1.041	5
2045	13	Rf 3	2	1.167	0.899	1.113	5
2046	14	Rf 4	2	1.167	0.899	1.113	5
2047	15	Rf 5	2	1.167	0.899	1.113	5
2048	16	Dk 4	1	0.500	1.395	0.717	6
2049	17	Dk 5	1	0.500	1.395	0.717	6
2050	18	Dk 6	1	0.500	1.395	0.717	6
2051	H89 DKR-4		—	—	—	—	—
2052	1	Zr 1	3	2.333	1.210	0.827	1
2053	2	Sg	1	0.333	1.815	0.551	1
2054	3	Dk 1	1	0.333	1.815	0.551	2
2055	4	Zr 2	3	1.167	0.825	1.212	2
2056	5	Bn	2	0.833	1.210	0.827	3
2057	6	Tg 1	3	1.833	0.880	1.137	3
2058	7	Rf 1	2	1.500	1.705	0.587	4
2059	8	Bd	1	0.333	1.485	0.674	4
2060	9	Tg 2	2	0.667	1.155	0.866	4
2061	10	Dk 2	1	0.500	2.310	0.433	5
2062	11	Rf 2	3	2.500	1.540	0.649	5
2063	12	Dk 3	1	0.333	2.145	0.466	6
2064	13	Dk 4	1	0.333	2.145	0.466	6
2065	H52 DKR-5		—	—	—	—	—
2066	1	Zr	1	0.500	1.815	0.551	1
2067	2	So 1	2	1.333	1.210	0.827	2
2068	3	So 2	3	1.250	0.715	1.399	3
2069	4	Bn	2	0.833	1.100	0.909	4
2070	5	Tg	4	2.583	0.660	1.515	4
2071	6	Rf 1	2	1.500	1.595	0.627	5
2072	7	Kc	1	0.250	1.265	0.791	5
2073	8	Rf 2	4	3.250	0.935	1.070	5
2074	9	Bd	1	0.250	1.265	0.791	5
2075	10	Dk 1	1	0.500	2.200	0.455	6
2076	11	Dk 2	1	0.250	1.540	0.649	6
2077	12	Dk 3	1	0.250	1.540	0.649	6
2078	13	Dk 4	1	0.250	1.540	0.649	6
2079	H83 MDB-1		—	—	—	—	—
2080	1	Zr 1	2	1.500	1.894	0.528	1
2081	2	Sg	1	0.500	2.281	0.438	2
2082	3	So 1	2	1.000	1.535	0.651	2
2083	4	So 2	2	0.833	1.205	0.830	3
2084	5	Kg 1	3	1.333	0.904	1.107	4
2085	6	Kg 2	3	1.167	0.803	1.245	5
2086	7	Kg 3	2	0.583	1.148	0.871	5
2087	8	So 3	2	0.533	1.019	0.982	6
2088	9	Zr 2	3	1.033	0.932	1.072	6
2089	10	Tg 1	4	3.000	1.420	0.704	6
2090	11	Tg 2	5	4.000	1.262	0.792	7
2091	12	Rf 1	2	1.333	1.291	0.775	7
2092	13	Tg 3	5	3.667	1.148	0.871	7
2093	14	Bd 1	1	0.250	1.808	0.553	7
2094	15	Dk 1	1	0.250	1.808	0.553	7
2095	16	Rf 2	2	1.250	1.779	0.562	8
2096	17	Rf 3	2	1.200	1.621	0.617	8
2097	18	Dk 2	1	0.200	1.650	0.606	8
2098	19	Bd 2	1	0.200	1.650	0.606	8
2099	20	Bd 3	1	0.200	1.650	0.606	8
2100	21	Dk 3	1	0.500	1.678	0.596	8
2101	22	Kc	1	0.200	1.535	0.651	8
2102	23	Bd 3	1	0.200	1.535	0.651	8
2103	24	Dk 4	1	0.200	1.535	0.651	8
2104	25	Rf 4	3	2.200	1.478	0.677	8
2105	26	Dk 5	1	0.500	2.166	0.462	8
2106	27	Dk 6	1	0.500	2.008	0.498	9
2107	28	Dk 7	1	0.333	1.865	0.536	9
2108	29	Dk 8	1	0.333	1.865	0.536	9

APPENDIX 18 (25):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2109	H58 MDB-2		—	—	—	—	—
2110	1	Zr 1	1	0.500	2.066	0.484	1
2111	2	Zr 2	2	1.500	1.490	0.671	2
2112	3	Zr 3	2	0.833	1.009	0.991	3
2113	4	Zr 4	3	1.033	0.625	1.601	4
2114	5	Tg 1	3	2.333	1.009	0.991	5
2115	6	Tg 2	5	3.667	0.625	1.601	5
2116	7	Dk 1	1	0.333	1.586	0.631	6
2117	8	Dk 2	1	0.333	1.586	0.631	6
2118	9	Dk 3	1	0.200	1.201	0.832	6
2119	10	Rf	3	2.200	1.009	0.991	6
2120	11	Kc	1	0.200	1.201	0.832	6
2121	12	Bd	1	0.200	1.201	0.832	6
2122	13	Dk 4	1	0.333	1.586	0.631	7
2123	14	Dk 5	1	0.333	1.586	0.631	7
2124	H53 MDB-3		—	—	—	—	—
2125	1	Zr 1	1	0.500	2.804	0.357	1
2126	2	Zr 2	2	1.500	2.200	0.455	2
2127	3	Zr 3	2	1.000	1.705	0.587	3
2128	4	Kg	2	0.833	1.320	0.758	4
2129	5	So 1	3	2.000	1.045	0.957	5
2130	6	Dk 1	1	0.333	1.650	0.606	6
2131	7	So 2	2	0.583	0.990	1.010	6
2132	8	Tg	4	2.833	1.045	0.957	7
2133	9	Bd	1	0.250	1.650	0.606	8
2134	10	St	1	0.250	1.650	0.606	8
2135	11	Rf	3	2.250	1.430	0.699	8
2136	12	Dk 2	1	0.333	2.035	0.492	9
2137	13	Dk 3	1	0.333	2.035	0.492	9
2138	H156 MDB4		—	—	—	—	—
2139	1	Zr 1	2	1.250	0.981	1.019	1
2140	2	Sg 2	1	0.500	1.324	0.755	1
2141	3	Kg 1	4	1.417	0.657	1.522	2
2142	4	Tg 1	6	3.083	0.809	1.235	3
2143	5	Tg 2	4	1.917	0.676	1.479	3
2144	6	So 1	2	0.583	0.905	1.105	3
2145	7	Rf 1	2	1.167	1.133	0.882	4
2146	8	Dk 1	1	0.167	1.152	0.868	4
2147	9	Rf 2	3	2.167	1.114	0.897	4
2148	10	Rt 3	2	1.167	1.133	0.882	4
2149	11	Rf 4	2	1.167	1.133	0.882	4
2150	12	Bd 1	1	0.250	1.019	0.981	4
2151	13	Rf 5	2	1.250	1.000	1.000	4
2152	14	Tg 3	6	3.083	0.771	1.296	4
2153	15	Tg 4	3	1.833	1.171	0.854	4
2154	16	Dk 2	1	0.500	1.476	0.677	5
2155	17	Dk 3	1	0.333	1.457	0.686	5
2156	18	Dk 4	1	0.333	1.457	0.686	5
2157	19	Dk 5	1	0.500	1.476	0.677	5
2158	20	Dk 6	1	0.500	1.476	0.677	5
2159	21	Dk 7	1	0.500	1.343	0.745	5
2160	22	Rf 6	2	1.167	1.095	0.913	5
2161	23	Rf 7	2	1.167	1.095	0.913	5
2162	24	Rf 8	2	1.167	1.095	0.913	5
2163	25	Dk 8	3	1.000	1.019	0.981	5
2164	26	Sr	1	0.167	1.114	0.897	5
2165	27	Bd 2	1	0.333	1.514	0.660	5
2166	28	Rf 10	3	2.333	1.476	0.677	5
2167	29	Dk 9	1	0.500	1.438	0.695	6
2168	30	Dk 10	1	0.500	1.438	0.695	6
2169	31	Dk 11	1	0.500	1.438	0.695	6
2170	32	Rf 11	2	1.333	1.343	0.745	6
2171	33	Rf 12	3	2.333	1.324	0.755	6
2172	34	Dk 12	1	0.333	1.819	0.550	6
2173	35	Dk 13	1	0.333	1.819	0.550	6
2174	36	Dk 14	1	0.500	1.686	0.593	7
2175	37	Dk 15	1	0.333	1.667	0.600	7
2176	38	Dk 16	1	0.333	1.667	0.600	7

APPENDIX 18 (26):RRA MEASURES (WITHOUT EXTERIOR)

2177	H104 MDB5	—	—	—	—	—	
2178	1	Zr	1	0.250	1.433	0.698	1
2179	2	Tg	4	3.500	0.287	3.490	2
2180	3	Bd	1	0.250	1.433	0.698	3
2181	4	Rf	2	1.250	0.860	1.163	3
2182	5	Dk 1	1	0.250	1.433	0.698	3
2183	6	Dk 2	1	0.500	2.006	0.499	4
2184	H9 TMK-1	—	—	—	—	—	
2185	1	Zr	1	0.250	1.374	0.728	1
2186	2	Tg	4	3.333	0.393	2.547	2
2187	3	Ms	1	0.250	1.374	0.728	3
2188	4	Rf	3	2.250	0.589	1.698	3
2189	5	Kc	1	0.250	1.374	0.728	3
2190	6	Dk 1	1	0.333	1.570	0.637	4
2191	7	Dk 2	1	0.333	1.570	0.637	4
2192	H40 TMK-2	—	—	—	—	—	
2193	1	Zr 1	2	1.000	1.733	0.577	1
2194	2	Zr 2	2	1.500	2.261	0.442	2
2195	3	Zr 3	2	1.000	1.356	0.737	2
2196	4	Dk 1	1	0.500	2.939	0.340	3
2197	5	Zr 4	2	0.833	1.130	0.885	3
2198	6	Tg	3	1.833	1.055	0.948	4
2199	7	Bd	1	0.333	1.733	0.577	5
2200	8	Ts	3	1.833	1.281	0.781	5
2201	9	Kc	1	0.333	1.959	0.510	6
2202	10	Rf	2	1.333	1.809	0.553	6
2203	11	Dk 2	1	0.500	2.487	0.402	7
2204	H10 TMK-3	—	—	—	—	—	
2205	1	Zr	1	0.250	1.374	0.728	1
2206	2	Tg	4	3.333	0.393	2.547	2
2207	3	Ms	1	0.250	1.374	0.728	3
2208	4	Rf	3	2.250	0.589	1.698	3
2209	5	Bd	1	0.250	1.374	0.728	3
2210	6	Dk 1	1	0.333	1.570	0.637	4
2211	7	Dk 2	1	0.333	1.570	0.637	4
2212	H113 TMK4	—	—	—	—	—	
2213	1	Zr	2	1.500	1.658	0.603	1
2214	2	Dk 1	1	0.500	2.336	0.428	2
2215	3	So	2	0.833	1.130	0.885	2
2216	4	Kg	3	1.333	0.754	1.327	3
2217	5	Rf 1	2	1.333	1.281	0.781	4
2218	6	Tg	3	1.667	0.829	1.206	4
2219	7	Dk 2	1	0.500	1.959	0.510	5
2220	8	Bd	1	0.333	1.507	0.664	5
2221	9	Rf 2	3	2.333	1.206	0.829	5
2222	10	Dk 3	1	0.333	1.884	0.531	6
2223	11	Dk 4	1	0.333	1.884	0.531	6
2224	H118 TMK5	—	—	—	—	—	
2225	1	Zr 1	1	0.500	1.851	0.540	1
2226	2	Zr 2	2	1.333	1.213	0.825	2
2227	3	Ts	3	1.700	0.702	1.424	3
2228	4	Tg	5	2.833	0.447	2.238	4
2229	5	Kc	1	0.333	1.340	0.746	4
2230	6	Rf 1	2	1.200	0.957	1.045	5
2231	7	Rf 2	2	1.200	0.957	1.045	5
2232	8	Rf 3	2	1.200	0.957	1.045	5
2233	9	Bd	1	0.200	1.085	0.922	5
2234	10	Dk 1	1	0.500	1.595	0.627	6
2235	11	Dk 2	1	0.500	1.595	0.627	6
2236	12	Dk 3	1	0.500	1.595	0.627	6
2237	H126 BRW1	—	—	—	—	—	
2238	1	Zr 1	1	0.333	1.469	0.681	1
2239	2	Zr 2	3	2.200	0.957	1.045	2
2240	3	Ts 1	5	2.417	0.581	1.722	3
2241	4	Sg	1	0.333	1.469	0.681	3
2242	5	Dk 1	1	0.200	1.093	0.915	4
2243	6	Bn	2	0.533	0.820	1.220	4
2244	7	Tg 1	4	2.033	0.786	1.273	4
2245	8	Tg 2	3	0.950	0.820	1.220	4
2246	9	Kw	3	2.000	1.127	0.887	5
2247	10	Kc	1	0.250	1.298	0.770	5
2248	11	Rf	2	1.250	1.230	0.813	5
2249	12	Ts 2	2	1.333	1.264	0.791	5
2250	13	Dk 2	2	1.333	1.572	0.636	6
2251	14	Dk 3	1	0.333	1.640	0.610	6
2252	15	Dk 4	1	0.500	1.742	0.574	6
2253	16	Bd 1	1	0.500	1.776	0.563	6
2254	17	Bd 2	1	0.500	2.084	0.480	7

APPENDIX 18 (27):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2255	H55 BRW-2		—	—	—	—	—
2256	1	Di	2	1.500	2.210	0.452	1
2257	2	Kt	1	0.500	2.787	0.359	2
2258	3	Zr 1	2	1.000	1.730	0.578	2
2259	4	Zr 2	2	1.000	1.345	0.743	3
2260	5	Zr 3	2	0.833	1.057	0.946	4
2261	6	Ts	3	1.700	0.865	1.156	5
2262	7	Tg 1	5	3.667	0.865	1.156	6
2263	8	Sr	1	0.333	1.442	0.694	6
2264	9	Kc	1	0.200	1.442	0.694	7
2265	10	Bd	1	0.200	1.442	0.694	7
2266	11	Rf	3	2.200	1.249	0.800	7
2267	12	Tg 2	1	0.200	1.442	0.694	7
2268	13	Dk 1	1	0.333	1.826	0.548	8
2269	14	Dk 2	1	0.333	1.826	0.548	8
2270	H64 BRW-3		—	—	—	—	—
2271	1	So 1	2	1.333	1.402	0.713	1
2272	2	Ts	3	1.750	0.935	1.070	2
2273	3	Sg 1	1	0.500	1.954	0.512	2
2274	4	Sg 2	1	0.333	1.487	0.673	3
2275	5	So 2	4	2.583	0.637	1.569	3
2276	6	Dk 1	1	0.250	1.190	0.841	4
2277	7	Dk 2	1	0.250	1.190	0.841	4
2278	8	Tg	4	2.000	0.595	1.681	4
2279	9	Ts 2	2	0.750	1.020	0.981	5
2280	10	Bd	1	0.250	1.147	0.872	5
2281	11	Rf	4	2.750	0.850	1.177	5
2282	12	Kc	2	1.000	1.359	0.736	6
2283	13	Dk 3	1	0.250	1.402	0.713	6
2284	14	Dk 4	2	0.750	1.275	0.785	6
2285	15	Dk 5	1	0.250	1.402	0.713	6
2286	H65 BRW-4		—	—	—	—	—
2287	1	Zr 1	1	0.500	1.480	0.676	1
2288	2	Zr 2	2	1.250	0.948	1.054	2
2289	3	Ts	4	1.500	0.493	2.028	3
2290	4	Rf 1	3	2.250	0.873	1.146	4
2291	5	Tg	6	4.250	0.493	2.028	4
2292	6	Rf2	2	1.250	0.948	1.054	4
2293	7	Dk 1	1	0.333	1.404	0.712	5
2294	8	Dk 2	1	0.333	1.404	0.712	5
2295	9	Rf3	2	1.167	0.948	1.054	5
2296	10	Ms	1	0.167	1.024	0.976	5
2297	11	Bd	1	0.167	1.024	0.976	5
2298	12	Tk	1	0.167	1.024	0.976	5
2299	13	Rf4	2	1.167	0.948	1.054	5
2300	14	Dk 3	1	0.500	1.480	0.676	5
2301	15	Dk 4	1	0.500	1.480	0.676	6
2302	16	Dk 5	1	0.500	1.480	0.676	6
2303	H106 BRW5		—	—	—	—	—
2304	1	Zr 1	1	0.500	1.885	0.530	1
2305	2	Zr 2	2	1.250	1.015	0.985	2
2306	3	Tg	4	2.500	0.435	2.299	3
2307	4	Kc	1	0.250	1.305	0.766	4
2308	5	Rf	2	1.250	1.015	0.985	4
2309	6	Sr	2	1.250	1.015	0.985	4
2310	7	Dk 1	1	0.500	1.885	0.530	5
2311	8	Bd	1	0.500	1.885	0.530	5

APPENDIX 18 (28):RRA MEASURES (WITHOUT EXTERIOR)

№	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2312	H160	DIS-1	—	—	—	—	—
2313	1	Zr 1	3	2.200	1.983	0.504	1
2314	2	Sg 1	1	0.333	2.225	0.449	1
2315	3	Sr 1	1	0.200	1.658	0.603	1
2316	4	Zr 2	1	0.333	1.967	0.508	1
2317	5	Dk 1	1	0.333	2.225	0.449	2
2318	6	Kg 1	5	3.833	1.751	0.571	2
2319	7	Kg 2	5	3.833	1.415	0.706	2
2320	8	Zr 3	3	1.833	1.725	0.580	2
2321	9	Zr 4	2	0.533	1.539	0.650	3
2322	10	Dk 2	1	0.200	1.993	0.502	3
2323	11	Bd 1	1	0.200	1.993	0.502	3
2324	12	Dk 3	1	0.200	1.993	0.502	3
2325	13	Zr 5	2	0.700	1.245	0.803	3
2326	14	Dk 4	1	0.200	1.658	0.603	3
2327	15	Kf	1	0.200	1.658	0.603	3
2328	16	Zr 6	3	0.783	1.606	0.623	3
2329	17	Kg 3	3	1.833	1.498	0.668	3
2330	18	Bn 1	2	1.333	1.962	0.510	3
2331	19	Tg 1	3	1.667	1.333	0.750	4
2332	20	Zr 7	2	0.750	1.080	0.926	4
2333	21	Zr 8	3	1.667	1.828	0.547	4
2334	22	Tg 2	4	2.833	1.828	0.547	4
2335	23	Bd 2	1	0.333	1.740	0.575	4
2336	24	Zr 9	2	0.444	1.281	0.780	4
2337	25	Dk 5	1	0.500	2.204	0.454	4
2338	26	Tg 3	6	3.667	1.137	0.880	5
2339	27	Bd 3	1	0.333	1.575	0.635	5
2340	28	Ts 1	4	1.833	0.920	1.086	5
2341	29	Sr 2	3	2.333	2.060	0.485	5
2342	30	Dk 6	1	0.333	2.070	0.483	5
2343	31	Rf 1	2	1.250	2.065	0.484	5
2344	32	Dk 7	1	0.250	2.070	0.483	5
2345	33	Rf 2	1	0.250	2.070	0.483	5
2346	34	Tg 4	9	6.083	1.070	0.935	5
2347	35	Kc 1	1	0.167	1.379	0.725	6
2348	36	Dk 8	1	0.167	1.379	0.725	6
2349	37	Rf 3	2	1.167	1.374	0.728	6
2350	38	Rf 4	2	1.167	1.374	0.728	6
2351	39	Ts 2	3	1.278	0.977	1.023	6
2352	40	Kg 4	3	0.861	0.853	1.172	6
2353	41	Zr 10	2	0.375	1.116	0.896	6
2354	42	Zr 11	2	0.450	1.132	0.884	6
2355	43	Bd 4	1	0.333	2.302	0.434	6
2356	44	Kc 2	1	0.333	2.302	0.434	6
2357	45	Dk 9	1	0.500	2.307	0.433	6
2358	46	Ts 3	2	0.222	0.946	1.057	6
2359	47	Bn 2	4	2.611	1.292	0.774	6
2360	48	St 2	1	0.111	1.312	0.762	6
2361	49	Dk 10	1	0.111	1.312	0.762	6
2362	50	Kc 3	1	0.111	1.312	0.762	6
2363	51	Rf 5	2	1.111	1.307	0.765	6
2364	52	Bn 3	3	1.444	1.292	0.774	6
2365	53	Bd 5	1	0.111	1.312	0.762	6
2366	54	Dk 11	1	0.500	1.617	0.619	7
2367	55	Dk 12	1	0.500	1.617	0.619	7
2368	56	St 3	1	0.333	1.220	0.820	7
2369	57	Tg 5	9	6.167	0.828	1.208	7
2370	58	Zr 12	2	0.583	1.065	0.939	7
2371	59	Zr 13	8	7.000	1.317	0.759	7
2372	60	Tg 6	5	4.000	1.348	0.742	7
2373	61	St 4	1	0.250	1.534	0.652	7
2374	62	Bd 6	1	0.250	1.534	0.652	7
2375	63	Rf 6	2	1.250	1.529	0.654	7
2376	64	Dk 13	1	0.500	1.550	0.645	7
2377	65	Dk 14	1	0.333	1.534	0.652	7
2378	66	Rf 7	3	2.333	1.524	0.656	7
2379	67	Dk 15	1	0.111	1.070	0.935	8
2380	68	Rf 8	1	0.111	1.070	0.935	8
2381	69	Bd 7	2	1.111	1.065	0.939	8
2382	70	Kc 4	1	0.111	1.070	0.935	8
2383	71	Dk 16	1	0.111	1.070	0.935	8
2384	72	Rf 9	2	1.111	1.065	0.939	8
2385	73	Tg 7	4	2.500	1.281	0.780	8
2386	74	Dk 17	1	0.125	1.560	0.641	8
2387	75	Rf 10	2	1.125	1.555	0.643	8
2388	76	Dk 18	1	0.125	1.560	0.641	8
2389	77	Bd 8	1	0.125	1.560	0.641	8
2390	78	Bd 9	1	0.125	1.560	0.641	8
2391	79	Dk 19	1	0.125	1.560	0.641	8
2392	80	Dk 20	1	0.125	1.560	0.641	8
2393	81	Rf 11	2	1.200	1.586	0.631	8
2394	82	Dk 21	1	0.200	1.591	0.629	8
2395	83	Dk 22	1	0.200	1.591	0.629	8
2396	84	Bd 10	1	0.200	1.591	0.629	8
2397	85	Dk 23	1	0.500	1.771	0.565	8
2398	86	Bd 11	1	0.333	1.766	0.566	8
2399	87	Dk 24	1	0.333	1.766	0.566	8
2400	88	Dk 25	1	0.500	1.307	0.765	9
2401	89	Dk 26	1	0.500	1.307	0.765	9
2402	90	Bd 12	1	0.250	1.524	0.656	9
2403	91	Rf 12	2	1.250	1.519	0.659	9
2404	92	Rf 13	2	1.250	1.519	0.659	9
2405	93	Dk 27	1	0.500	1.797	0.556	9
2406	94	Dk 28	1	0.500	1.828	0.547	9
2407	95	Dk 29	1	0.500	1.761	0.568	10
2408	96	Dk 30	1	0.500	1.761	0.568	10

APPENDIX 18(29):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2409	H75 DIS-2		—	—	—	—	—
2410	1	Zr 1	2	0.833	1.075	0.930	1
2411	2	Zr 2	2	1.000	1.387	0.721	2
2412	3	Zr 3	3	1.643	0.821	1.219	2
2413	4	Bn 1	2	1.000	1.754	0.570	3
2414	5	Dk 1	1	0.333	1.302	0.768	3
2415	6	Tg	7	4.833	0.679	1.473	3
2416	7	Rf 1	2	1.500	2.179	0.459	4
2417	8	Dk 2	1	0.143	1.160	0.862	4
2418	9	Bn 2	2	0.643	0.990	1.010	4
2419	10	Rf 2	2	1.143	1.104	0.906	4
2420	11	Bn 3	2	1.143	1.104	0.906	4
2421	12	Dk 3	1	0.143	1.160	0.862	4
2422	13	Bd	1	0.143	1.160	0.862	4
2423	14	Dk 4	1	0.500	2.660	0.376	5
2424	15	Kw	2	1.000	1.358	0.736	5
2425	16	Dk 5	1	0.500	1.585	0.631	5
2426	17	Dk 6	1	0.500	1.585	0.631	5
2427	18	Rf 3	2	1.500	1.783	0.561	6
2428	19	Dk 7	1	0.500	2.264	0.442	7
2429	H157 DIS-3		—	—	—	—	—
2430	1	Zr 1	1	0.200	1.074	0.931	1
2431	2	Kg 1	5	2.250	0.673	1.485	2
2432	3	Tg 1	3	1.700	0.978	1.023	3
2433	4	Kg 2	4	1.533	0.625	1.599	3
2434	5	Tg 2	3	2.200	1.010	0.990	3
2435	6	Tg 3	3	2.200	1.010	0.990	3
2436	7	Ms 1	1	0.333	1.379	0.725	4
2437	8	Rf 1	2	1.333	1.347	0.743	4
2438	9	Zr 2	2	0.583	0.898	1.114	4
2439	10	Tg 4	3	2.250	0.962	1.040	4
2440	11	Zr 3	2	0.500	0.866	1.155	4
2441	12	Dk 1	1	0.333	1.411	0.709	4
2442	13	Bd 1	1	0.333	1.411	0.709	4
2443	14	Dk 2	1	0.333	1.411	0.709	4
2444	15	Bd 2	1	0.333	1.411	0.709	4
2445	16	Dk 3	1	0.500	1.748	0.572	5
2446	17	Tg 5	3	2.000	1.202	0.832	5
2447	18	Dk 4	1	0.333	1.363	0.734	5
2448	19	Ms 2	1	0.333	1.363	0.734	5
2449	20	Tg 6	4	3.000	1.138	0.878	5
2450	21	Rf 2	2	1.333	1.571	0.636	6
2451	22	Bd 3	1	0.333	1.603	0.624	6
2452	23	Dk 5	1	0.250	1.539	0.650	6
2453	24	Rf 3	2	1.250	1.507	0.664	6
2454	25	Bd 4	1	0.250	1.539	0.650	6
2455	26	Dk 6	1	0.500	1.972	0.507	7
2456	27	Dk 7	1	0.500	1.908	0.524	7
2457	H66 DIS-4		—	—	—	—	—
2458	1	Zr 1	1	0.500	2.200	0.454	1
2459	2	Zr 2	2	1.333	1.669	0.599	2
2460	3	Kg	3	2.000	1.214	0.824	3
2461	4	Tr	1	0.333	1.745	0.573	4
2462	5	Zr 3	2	0.583	0.910	1.098	4
2463	6	Ts 1	4	2.250	0.683	1.464	5
2464	7	Dk 1	1	0.250	1.214	0.824	6
2465	8	Rf 1	2	1.250	1.138	0.879	6
2466	9	Tg	4	2.083	0.759	1.318	6
2467	10	Dk 2	1	0.500	1.669	0.599	7
2468	11	Rf 2	2	1.250	1.214	0.824	7
2469	12	Ts 2	3	2.250	1.138	0.879	7
2470	13	Kc	1	0.250	1.290	0.775	7
2471	14	Dk 3	1	0.500	1.745	0.573	8
2472	15	Bd	1	0.333	1.669	0.599	8
2473	16	Ms	1	0.333	1.669	0.599	8
2474	H23 DIS-5		—	—	—	—	—
2475	1	Zr 1	1	0.500	2.029	0.493	1
2476	2	Zr 2	2	1.500	1.240	0.806	2
2477	3	Zr 3	2	0.667	0.676	1.478	3
2478	4	Tg	6	5.500	0.338	2.957	4
2479	5	Dk 1	1	0.167	1.127	0.887	5
2480	6	Dk 2	1	0.167	1.127	0.887	5
2481	7	Dk 3	1	0.167	1.127	0.887	5
2482	8	Bd	1	0.167	1.127	0.887	5
2483	9	Kc	1	0.167	1.127	0.887	5

APPENDIX 18 (30):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2484	H150 JNG-1		—	—	—	—	—
2485	1	Zr 1	1	0.333	1.133	0.882	1
2486	2	Zr 2	3	1.533	0.746	1.341	2
2487	3	Ts 1	3	1.167	0.990	1.010	3
2488	4	Ts 2	5	1.667	0.559	1.787	3
2489	5	Rf 1	2	1.333	1.348	0.742	4
2490	6	Tg 1	3	2.333	1.320	0.758	4
2491	7	Tg 2	4	3.200	0.861	1.162	4
2492	8	Tg 3	3	1.700	0.861	1.162	4
2493	9	Zr 3	2	0.450	0.803	1.245	4
2494	10	Tg 4	4	2.533	0.803	1.245	4
2495	11	Dk 1	1	0.500	1.736	0.576	5
2496	12	Kc 1	1	0.333	1.707	0.586	5
2497	13	Bd 1	1	0.333	1.707	0.586	5
2498	14	Dk 2	1	0.250	1.248	0.801	5
2499	15	Kc 2	1	0.250	1.248	0.801	5
2500	16	Bd 2	1	0.250	1.248	0.801	5
2501	17	Rf 2	2	1.333	1.219	0.820	5
2502	18	Bd 3	1	0.333	1.248	0.801	5
2503	19	Tg 5	4	3.000	1.076	0.929	5
2504	20	Bd 4	1	0.250	1.191	0.840	5
2505	21	Kc 3	1	0.250	1.191	0.840	5
2506	22	Rf 3	3	2.250	1.133	0.882	5
2507	23	Dk 3	1	0.500	1.607	0.622	6
2508	24	Rf 4	2	1.250	1.435	0.697	6
2509	25	Kc 4	1	0.250	1.463	0.683	6
2510	26	Bd 5	1	0.250	1.463	0.683	6
2511	27	Dk 4	1	0.333	1.521	0.658	6
2512	28	Dk 5	1	0.333	1.521	0.658	6
2513	29	Dk 6	1	0.500	1.822	0.549	7
2514	H93 JNG-2		—	—	—	—	—
2515	1	Zr 1	1	0.200	1.952	0.512	1
2516	2	Sg	1	0.200	1.952	0.512	1
2517	3	Kg	5	4.500	1.457	0.687	2
2518	4	Bd 1	1	0.200	1.952	0.512	3
2519	5	Zr 2	2	0.700	1.209	0.827	3
2520	6	Dk 1	1	0.200	1.952	0.512	3
2521	7	So	2	0.833	1.023	0.978	4
2522	8	Tg 1	3	1.333	0.899	1.113	5
2523	9	Tg 2	3	1.667	1.147	0.872	6
2524	10	Bn	2	0.667	1.147	0.872	6
2525	11	Rf 1	3	2.333	1.519	0.658	7
2526	12	Kc	1	0.333	1.643	0.609	7
2527	13	Rf 2	3	2.000	1.457	0.687	7
2528	14	Dk 2	1	0.333	2.014	0.496	8
2529	15	Dk 3	1	0.333	2.014	0.496	8
2530	16	Bd 2	1	0.333	1.952	0.512	8
2531	17	Dk 4	2	1.333	1.891	0.529	8
2532	18	Dk 5	1	0.500	2.386	0.419	9
2533	H149 JNG-3		—	—	—	—	—
2534	1	Kd	1	0.500	1.484	0.674	1
2535	2	Zr 1	2	1.167	1.068	0.936	2
2536	3	Tg 1	6	3.500	0.688	1.454	3
2537	4	So 1	3	1.500	0.778	1.285	4
2538	5	Rf 1	3	2.167	1.032	0.969	4
2539	6	Dk 1	1	0.167	1.104	0.906	4
2540	7	Dk 2	1	0.167	1.104	0.906	4
2541	8	So 2	3	1.500	0.887	1.128	4
2542	9	Ts	3	1.167	0.941	1.062	5
2543	10	Dk 3	1	0.333	1.195	0.837	5
2544	11	Dk 4	1	0.333	1.448	0.691	5
2545	12	Dk 5	1	0.333	1.448	0.691	5
2546	13	Dk 6	1	0.333	1.303	0.767	5
2547	14	Tg 2	3	1.667	1.158	0.863	5
2548	15	Tg 3	3	1.667	1.213	0.825	6
2549	16	Rf 2	2	1.333	1.321	0.757	6
2550	17	Rf 3	3	2.333	1.502	0.666	6
2551	18	Bd 1	1	0.333	1.575	0.635	6
2552	19	Bd 2	1	0.333	1.629	0.614	7
2553	20	Rf 4	3	2.333	1.557	0.642	7
2554	21	Dk 7	1	0.500	1.738	0.576	7
2555	22	Dk 8	1	0.333	1.919	0.521	7
2556	23	Dk 9	1	0.333	1.919	0.521	7
2557	24	Dk 10	1	0.333	1.973	0.507	8
2558	25	Dk 11	1	0.333	1.973	0.507	8

APPENDIX 18 (31):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr	RRA	1/X RRA	Depth
2559	H154 JNG-4		–	–	–	–	–
2560	1	Zr	1	0.250	1.283	0.780	1
2561	2	Ts	4	3.333	0.913	1.096	2
2562	3	Bd 1	1	0.250	1.283	0.780	3
2563	4	Kg	3	0.708	0.617	1.622	3
2564	5	Kc 1	1	0.250	1.283	0.780	3
2565	6	Tg1	8	4.283	0.419	2.385	4
2566	7	Rf 1	3	2.333	0.937	1.067	4
2567	8	Kc 2	1	0.125	0.789	1.267	5
2568	9	Bd 2	1	0.125	0.789	1.267	5
2569	10	Tg 2	5	3.125	0.641	1.559	5
2570	11	Tg 3	4	2.625	0.691	1.448	5
2571	12	Tg 4	2	0.625	0.740	1.351	5
2572	13	Rf 2	2	1.125	0.765	1.308	5
2573	14	Rf 3	2	0.458	0.715	1.398	5
2574	15	Dk 1	1	0.333	1.307	0.765	5
2575	16	Dk 2	1	0.333	1.307	0.765	5
2576	17	Rf 4	2	1.200	0.987	1.014	6
2577	18	Rf 5	2	1.200	0.987	1.014	6
2578	19	Kc 3	1	0.200	1.011	0.989	6
2579	20	Bd 3	1	0.200	1.011	0.989	6
2580	21	Rf 6	2	1.250	1.036	0.965	6
2581	22	Kc 4	1	0.250	1.061	0.943	6
2582	23	Bd 4	1	0.250	1.061	0.943	6
2583	24	Rf 7	2	1.500	1.085	0.921	6
2584	25	Dk 3	1	0.500	1.135	0.881	6
2585	26	Dk 4	3	2.500	1.036	0.965	6
2586	27	Dk 5	1	0.500	1.357	0.737	7
2587	28	Dk 6	1	0.500	1.357	0.737	7
2588	29	Dk 7	1	0.500	1.406	0.711	7
2589	30	Dk 8	1	0.500	1.455	0.687	7
2590	31	Dk 9	1	0.333	1.406	0.711	7
2591	32	Dk 10	1	0.333	1.406	0.711	7
2592	H138 JNG-5		–	–	–	–	–
2593	1	Zr 1	1	0.500	1.784	0.560	1
2594	2	Zr 2	2	1.333	1.232	0.812	2
2595	3	Zr 3	3	1.250	0.765	1.308	3
2596	4	Tg	4	2.583	0.807	1.239	4
2597	5	Bn	2	0.667	0.977	1.023	4
2598	6	Rf 1	4	3.250	1.105	0.905	5
2599	7	Kc	1	0.250	1.359	0.736	5
2600	8	Bd 1	1	0.250	1.359	0.736	5
2601	9	Rf 2	3	2.000	1.275	0.785	5
2602	10	Dk 1	1	0.250	1.657	0.604	6
2603	11	Dk 2	1	0.250	1.657	0.604	6
2604	12	Dk 3	1	0.250	1.657	0.604	6
2605	13	Dk 4	1	0.333	1.827	0.547	6
2606	14	Dk 5	2	1.333	1.742	0.574	6
2607	15	Bd 2	1	0.500	2.294	0.436	7
2608	H132 LMK1		–	–	–	–	–
2609	1	Zr	1	0.333	1.367	0.732	1
2610	2	Sg	1	0.333	1.367	0.732	1
2611	3	Kg 1	3	2.333	0.854	1.171	2
2612	4	Kg 2	3	0.676	0.478	2.091	3
2613	5	Tg 1	7	6.333	0.581	1.722	4
2614	6	Tg 2	5	3.833	0.649	1.541	4
2615	7	Bd 1	1	0.143	1.093	0.915	5
2616	8	Dk 1	1	0.143	1.093	0.915	5
2617	9	Dk 2	1	0.143	1.093	0.915	5
2618	10	Dk 3	1	0.143	1.093	0.915	5
2619	11	Dk 4	1	0.143	1.093	0.915	5
2620	12	Dk 5	1	0.143	1.093	0.915	5
2621	13	Bd 2	1	0.200	1.162	0.861	5
2622	14	Kc	1	0.200	1.162	0.861	5
2623	15	Tg 3	2	1.200	1.093	0.915	5
2624	16	Dk 6	1	0.200	1.162	0.861	5
2625	17	Dk 7	1	0.500	1.606	0.623	6
2626	H68 LMK-2		–	–	–	–	–
2627	1	Zr 1	1	0.333	1.230	0.813	1
2628	2	Zr 2	3	1.533	0.717	1.394	2
2629	3	Bn	3	1.833	0.957	1.045	3
2630	4	Tg	5	2.500	0.615	1.626	3
2631	5	Rf 1	2	0.833	1.332	0.751	4
2632	6	Dk 1	1	0.333	1.469	0.681	4
2633	7	Ts	3	2.200	0.991	1.009	4
2634	8	Rf 2	2	1.200	1.059	0.944	4
2635	9	Rf 3	3	2.200	0.991	1.009	4
2636	10	Dk 2	1	0.200	1.127	0.887	4
2637	11	Dk 3	2	1.500	1.776	0.563	5
2638	12	Bd	1	0.333	1.503	0.665	5
2639	13	Kc	1	0.333	1.503	0.665	5
2640	14	Dk 4	1	0.500	1.572	0.636	5
2641	15	Dk 5	1	0.333	1.503	0.665	5
2642	16	Dk 6	1	0.333	1.503	0.665	5
2643	17	Dk 7	1	0.500	2.289	0.437	6

APPENDIX 18 (32):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2644	H79 LMK-3		—	—	—	—	—
2645	1	Fr	1	0.500	1.846	0.542	1
2646	2	Zr 1	2	1.333	1.390	0.719	2
2647	3	So	3	1.333	0.983	1.017	3
2648	4	Zr 2	2	0.476	0.767	1.303	4
2649	5	Bn 1	3	2.333	1.343	0.745	4
2650	6	Tg	7	4.500	0.599	1.668	5
2651	7	St	1	0.333	1.798	0.556	5
2652	8	Dk 1	1	0.333	1.798	0.556	5
2653	9	Bn 2	2	0.643	0.911	1.098	6
2654	10	Rf 1	2	1.143	1.007	0.993	6
2655	11	Dk 2	1	0.143	1.055	0.948	6
2656	12	Kc	1	0.143	1.055	0.948	6
2657	13	Ts	2	1.143	1.007	0.993	6
2658	14	Bn 3	2	0.643	0.959	1.043	6
2659	15	Kw 1	2	1.000	1.271	0.787	7
2660	16	Dk 3	1	0.500	1.462	0.684	7
2661	17	Bd	1	0.500	1.462	0.684	7
2662	18	Kw 2	2	1.500	1.367	0.732	7
2663	19	Rf 2	2	1.500	1.678	0.596	8
2664	20	Dk 4	1	0.500	1.822	0.549	8
2665	21	Dk 5	1	0.500	2.134	0.469	9
2666	H107 LMK4		—	—	—	—	—
2667	1	Zr 1	1	0.500	1.691	0.591	1
2668	2	Zr 2	2	1.200	0.902	1.109	2
2669	3	Tg	5	3.833	0.338	2.957	3
2670	4	Kc	1	0.200	1.127	0.887	4
2671	5	Rf	3	2.200	0.676	1.478	4
2672	6	Dk 1	1	0.200	1.127	0.887	4
2673	7	Bd	1	0.200	1.127	0.887	4
2674	8	Dk 2	1	0.333	1.466	0.682	5
2675	9	Dk 3	1	0.333	1.466	0.682	5
2676	H57 LMK-5		—	—	—	—	—
2677	1	Zr 1	1	0.500	1.730	0.578	1
2678	2	Zr 2	2	1.333	1.153	0.867	2
2679	3	Zr 3	3	1.083	0.673	1.487	3
2680	4	Ts	4	2.083	0.577	1.734	4
2681	5	Tg 1	3	2.333	1.057	0.946	4
2682	6	Rf 1	2	1.250	1.057	0.946	5
2683	7	Dk 1	1	0.250	1.153	0.867	5
2684	8	Tg 2	4	3.250	0.865	1.156	5
2685	9	Dk 2	1	0.333	1.634	0.612	5
2686	10	Bd 1	1	0.333	1.634	0.612	5
2687	11	Dk 3	1	0.500	1.634	0.612	6
2688	12	Bd 2	1	0.250	1.442	0.694	6
2689	13	Kc	1	0.250	1.442	0.694	6
2690	14	Rf 2	1	0.250	1.442	0.694	6
2691	H77 SMN-1		—	—	—	—	—
2692	1	Zr1	1	0.333	1.556	0.643	1
2693	2	Zr2	3	2.333	1.075	0.930	2
2694	3	St	1	0.333	1.556	0.643	3
2695	4	Kg	3	1.476	0.707	1.414	3
2696	5	Dk1	1	0.333	1.188	0.841	4
2697	6	Tg	7	4.667	0.453	2.209	4
2698	7	Bn	3	0.976	0.651	1.537	5
2699	8	Bd1	1	0.143	0.934	1.071	5
2700	9	Rf1	2	1.143	0.877	1.140	5
2701	10	Dk2	1	0.143	0.934	1.071	5
2702	11	Rf2	2	1.143	0.877	1.140	5
2703	12	Bd2	1	0.143	0.934	1.071	5
2704	13	Rf3	3	2.333	1.019	0.982	6
2705	14	Rf4	2	1.333	1.075	0.930	6
2706	15	Dk2	1	0.500	1.358	0.736	6
2707	16	Dk4	1	0.500	1.358	0.736	6
2708	17	Dk5	1	0.333	1.500	0.667	7
2709	18	Dk6	1	0.333	1.500	0.667	7
2710	19	Dk7	1	0.500	1.556	0.643	7
2711	H47 SMN-2		—	—	—	—	—
2712	1	Zr	1	0.333	1.276	0.783	1
2713	2	Kg	3	2.143	0.638	1.567	2
2714	3	Tg	7	5.667	0.255	3.917	3
2715	4	Dk 1	1	0.333	1.276	0.783	3
2716	5	Bd	1	0.143	0.893	1.119	4
2717	6	Wk	1	0.143	0.893	1.119	4
2718	7	Kc	1	0.143	0.893	1.119	4
2719	8	St	1	0.143	0.893	1.119	4
2720	9	Dk 2	1	0.143	0.893	1.119	4
2721	10	Rf	3	2.143	0.638	1.567	4
2722	11	Dk 3	1	0.333	1.276	0.783	5
2723	12	Dk 4	1	0.333	1.276	0.783	5

APPENDIX 18 (33):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2724	H86 SMN-3		—	—	—	—	—
2725	1	Sg	1	0.167	1.091	0.917	1
2726	2	Zr 1	1	0.500	1.818	0.550	1
2727	3	Tg	6	5.333	0.364	2.750	2
2728	4	Zr 2	2	1.333	1.091	0.917	2
2729	5	Dk 1	1	0.167	1.091	0.917	3
2730	6	Dk 2	1	0.167	1.091	0.917	3
2731	7	Dk 3	1	0.167	1.091	0.917	3
2732	8	Bd	1	0.167	1.091	0.917	3
2733	9	Ts	3	1.667	0.545	1.833	3
2734	10	Kc	1	0.333	1.273	0.786	4
2735	H69 SMN-4		—	—	—	—	—
2736	1	Zr 1	1	0.500	1.845	0.542	1
2737	2	Zr 2	2	1.333	1.332	0.751	2
2738	3	Zr 3	3	1.500	0.888	1.126	3
2739	4	Kg	2	0.500	0.786	1.273	4
2740	5	Bn	2	0.667	1.196	0.836	4
2741	6	Tg	6	4.000	0.752	1.331	5
2742	7	Rf 1	3	2.500	1.572	0.636	5
2743	8	Rf 2	2	1.167	1.196	0.836	6
2744	9	Dk 1	1	0.167	1.264	0.791	6
2745	10	Rf 3	2	1.167	1.196	0.836	6
2746	11	Rf 4	2	1.167	1.196	0.836	6
2747	12	Bd	1	0.167	1.264	0.791	6
2748	13	Dk 2	1	0.333	2.084	0.480	6
2749	14	Dk 3	1	0.333	2.084	0.480	6
2750	15	Dk 4	1	0.500	1.708	0.585	7
2751	16	Dk 5	1	0.500	1.708	0.585	7
2752	17	Dk 6	1	0.500	1.708	0.585	7
2753	H92 SMN-5		—	—	—	—	—
2754	1	Sg	1	0.500	1.503	0.665	1
2755	2	Zr	2	1.250	0.991	1.009	1
2756	3	So	4	2.000	0.547	1.829	2
2757	4	Bn	3	1.750	0.854	1.171	3
2758	5	Bd 1	1	0.250	1.059	0.944	3
2759	6	Tg	6	3.750	0.512	1.951	3
2760	7	Rf 1	2	1.333	1.298	0.770	4
2761	8	Bd 2	1	0.333	1.367	0.732	4
2762	9	Bd 3	1	0.167	1.025	0.976	4
2763	10	Rf 2	2	1.167	0.957	1.045	4
2764	11	Rf 3	2	1.167	0.957	1.045	4
2765	12	Rf 4	2	1.167	0.957	1.045	4
2766	13	Kc	1	0.167	1.025	0.976	4
2767	14	Dk 1	1	0.500	1.811	0.552	5
2768	15	Dk 2	1	0.500	1.469	0.681	5
2769	16	Dk 3	1	0.500	1.469	0.681	5
2770	17	Dk 4	1	0.500	1.469	0.681	5
2771	H42 WRR-1		—	—	—	—	—
2772	1	Zr 1	1	0.500	1.884	0.531	1
2773	2	Zr 2	2	1.333	1.206	0.829	2
2774	3	Kg	3	1.700	0.678	1.475	3
2775	4	Tk	1	0.333	1.356	0.737	4
2776	5	Tg	5	3.667	0.452	2.212	4
2777	6	Dk 1	1	0.200	1.130	0.885	5
2778	7	Ms	1	0.200	1.130	0.885	5
2779	8	Kc	3	2.200	0.829	1.206	5
2780	9	Rf	1	0.200	1.130	0.885	5
2781	10	Dk 2	1	0.333	1.507	0.664	6
2782	11	Dk 3	1	0.333	1.507	0.664	6
2783	H123 WRR2		—	—	—	—	—
2784	1	Zr 1	1	0.500	1.538	0.650	1
2785	2	Zr 2	2	1.200	0.961	1.041	2
2786	3	Tg 1	5	2.667	0.481	2.081	3
2787	4	Bn	2	0.533	0.769	1.301	4
2788	5	Rf 1	3	2.200	0.865	1.156	4
2789	6	Tg 2	3	2.200	0.865	1.156	4
2790	7	Dk 1	1	0.200	1.057	0.946	4
2791	8	Rf 2	3	2.500	1.153	0.867	5
2792	9	Dk 2	1	0.333	1.442	0.694	5
2793	10	Dk 3	1	0.333	1.442	0.694	5
2794	11	Dk 4	1	0.333	1.442	0.694	5
2795	12	Bd	1	0.333	1.442	0.694	5
2796	13	Dk 5	1	0.333	1.730	0.578	6
2797	14	Dk 6	1	0.333	1.730	0.578	6
2798	H115 WRR3		—	—	—	—	—
2799	1	Zr 1	1	0.500	2.617	0.382	1
2800	2	Zr 2	2	1.500	1.978	0.505	2
2801	3	Kg	2	1.000	1.468	0.681	3
2802	4	Zr 3	2	1.000	1.085	0.922	4
2803	5	Zr 4	2	0.667	0.830	1.205	5
2804	6	Tg	6	5.000	0.702	1.424	6
2805	7	Sr	1	0.167	1.340	0.746	7
2806	8	Kc	1	0.167	1.340	0.746	7
2807	9	Bd	1	0.167	1.340	0.746	7
2808	10	Rf	2	1.167	1.213	0.825	7
2809	11	Dk 1	1	0.167	1.340	0.746	7
2810	12	Dk 2	1	0.500	1.851	0.540	8

APPENDIX 18 (34):RRA MEASURES (WITHOUT EXTERIOR)

No	Space	Desig	Conn.	Contr.	RRA	1/X RRA	Depth
2811	H43 WRR-4		—	—	—	—	—
2812	1	Zr 1	3	2.500	1.582	0.632	1
2813	2	Sg 1	1	0.333	2.261	0.442	2
2814	3	Sg 2	1	0.333	2.261	0.442	2
2815	4	Zr 2	2	0.833	1.206	0.829	2
2816	5	Kc	2	0.833	0.980	1.021	3
2817	6	Tg	3	1.750	0.904	1.106	4
2818	7	Rf	4	3.333	1.130	0.885	5
2819	8	Bd	1	0.333	1.582	0.632	5
2820	9	Dk 1	1	0.250	1.809	0.553	6
2821	10	Dk 2	1	0.250	1.809	0.553	6
2822	11	Dk 3	1	0.250	1.809	0.553	6
2823	H151 WRR5		—	—	—	—	—
2824	1	Zr 1	2	1.500	1.439	0.695	1
2825	2	Sg	1	0.500	1.774	0.564	1
2826	3	Zr 2	2	1.000	1.121	0.892	2
2827	4	Zr 3	2	0.643	0.821	1.218	3
2828	5	Kg	7	3.000	0.538	1.857	4
2829	6	Ts 1	3	1.393	0.786	1.273	5
2830	7	Tg 1	3	2.143	0.838	1.193	5
2831	8	Kc 1	3	0.543	0.591	1.691	5
2832	9	Tg 2	2	0.643	0.838	1.193	5
2833	10	Bn 1	2	0.643	0.838	1.193	5
2834	11	Sr	2	0.643	0.838	1.193	5
2835	12	Rf 1	4	3.333	1.068	0.936	6
2836	13	Bd 1	1	0.333	1.121	0.892	6
2837	14	Dk 1	1	0.333	1.174	0.852	6
2838	15	Dk 2	1	0.333	1.174	0.852	6
2839	16	Tg 3	5	3.667	0.821	1.218	6
2840	17	Tg 4	5	3.000	0.786	1.273	6
2841	18	Rf 2	2	1.500	1.156	0.865	6
2842	19	Kw	2	1.500	1.156	0.865	6
2843	20	Rf 3	2	1.500	1.156	0.865	6
2844	21	Dk 3	1	0.250	1.403	0.713	7
2845	22	Dk 4	1	0.250	1.403	0.713	7
2846	23	Dk 5	1	0.250	1.403	0.713	7
2847	24	Dk 6	1	0.200	1.156	0.865	7
2848	25	Kc 2	1	0.200	1.156	0.865	7
2849	26	Rf 4	3	2.200	1.121	0.892	7
2850	27	Bd 2	1	0.200	1.156	0.865	7
2851	28	Bn 2	3	2.200	1.086	0.921	7
2852	29	Bd 3	1	0.200	1.121	0.892	7
2853	30	Rf 5	3	2.200	1.086	0.921	7
2854	31	Kc 3	1	0.200	1.121	0.892	7
2855	32	Dk 7	1	0.500	1.492	0.670	7
2856	33	Dk 8	1	0.500	1.492	0.670	7
2857	34	Dk 9	1	0.500	1.492	0.670	7
2858	35	Dk 10	1	0.333	1.456	0.687	8
2859	36	Dk 11	1	0.333	1.456	0.687	8
2860	37	Bd 4	1	0.333	1.421	0.704	8
2861	38	Dk 12	1	0.333	1.421	0.704	8
2862	39	Dk 13	1	0.333	1.421	0.704	8
2863	40	Dk 14	1	0.333	1.421	0.704	8

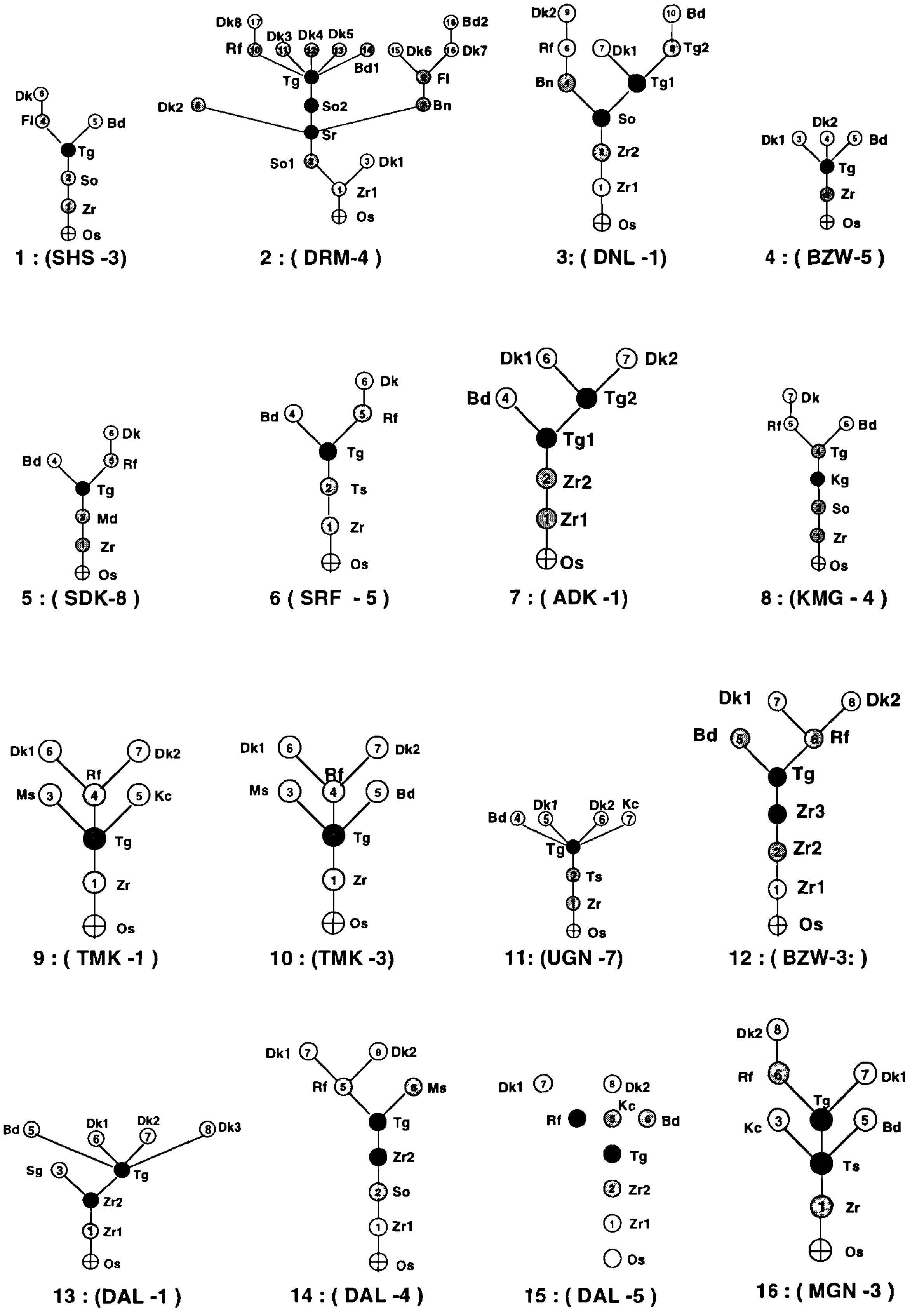


FIGURE A19.1.1a : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES

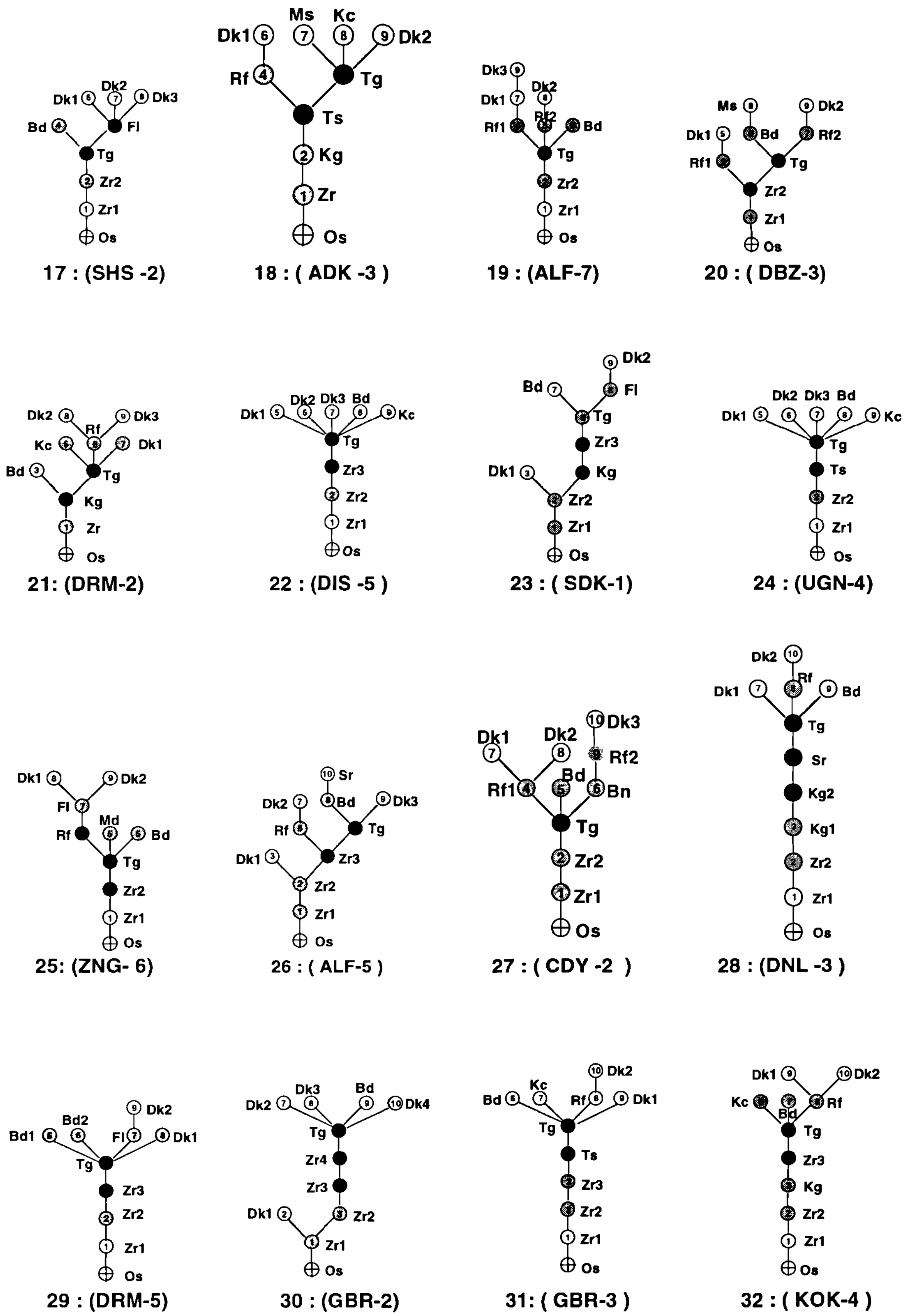


FIGURE A19.1.1b : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES

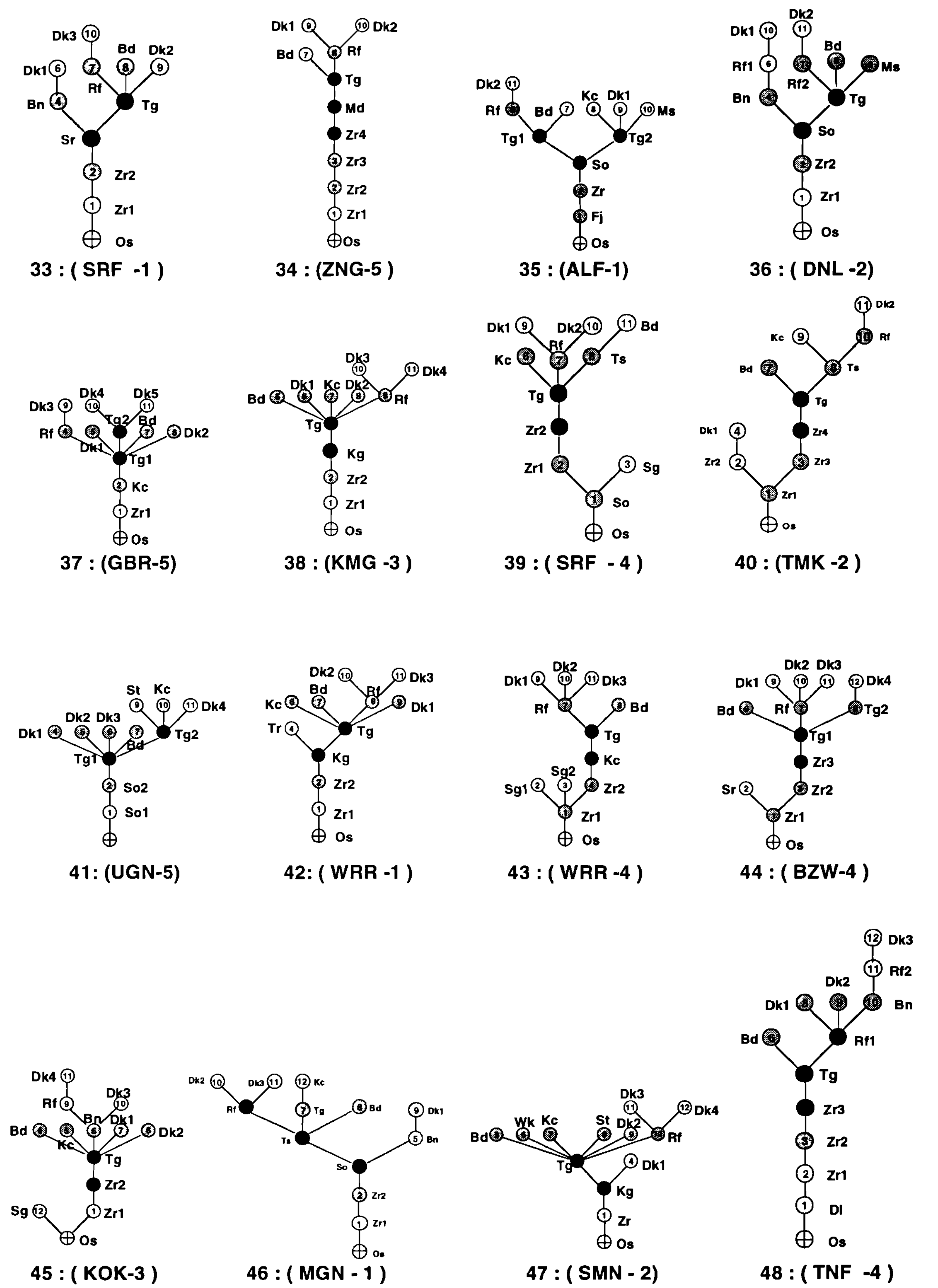


FIGURE A19.1.1c : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES

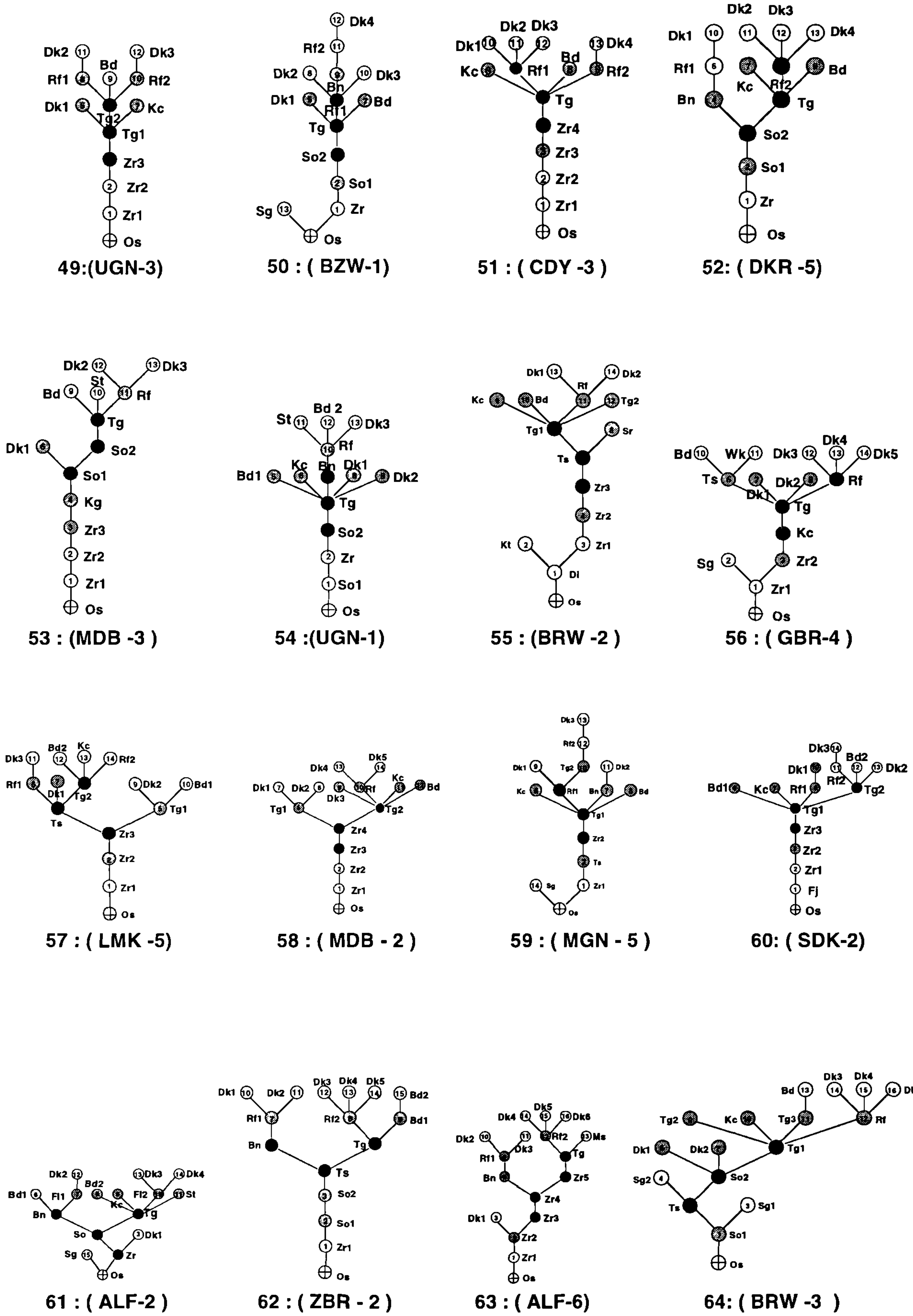


FIGURE A19.1.1d : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES

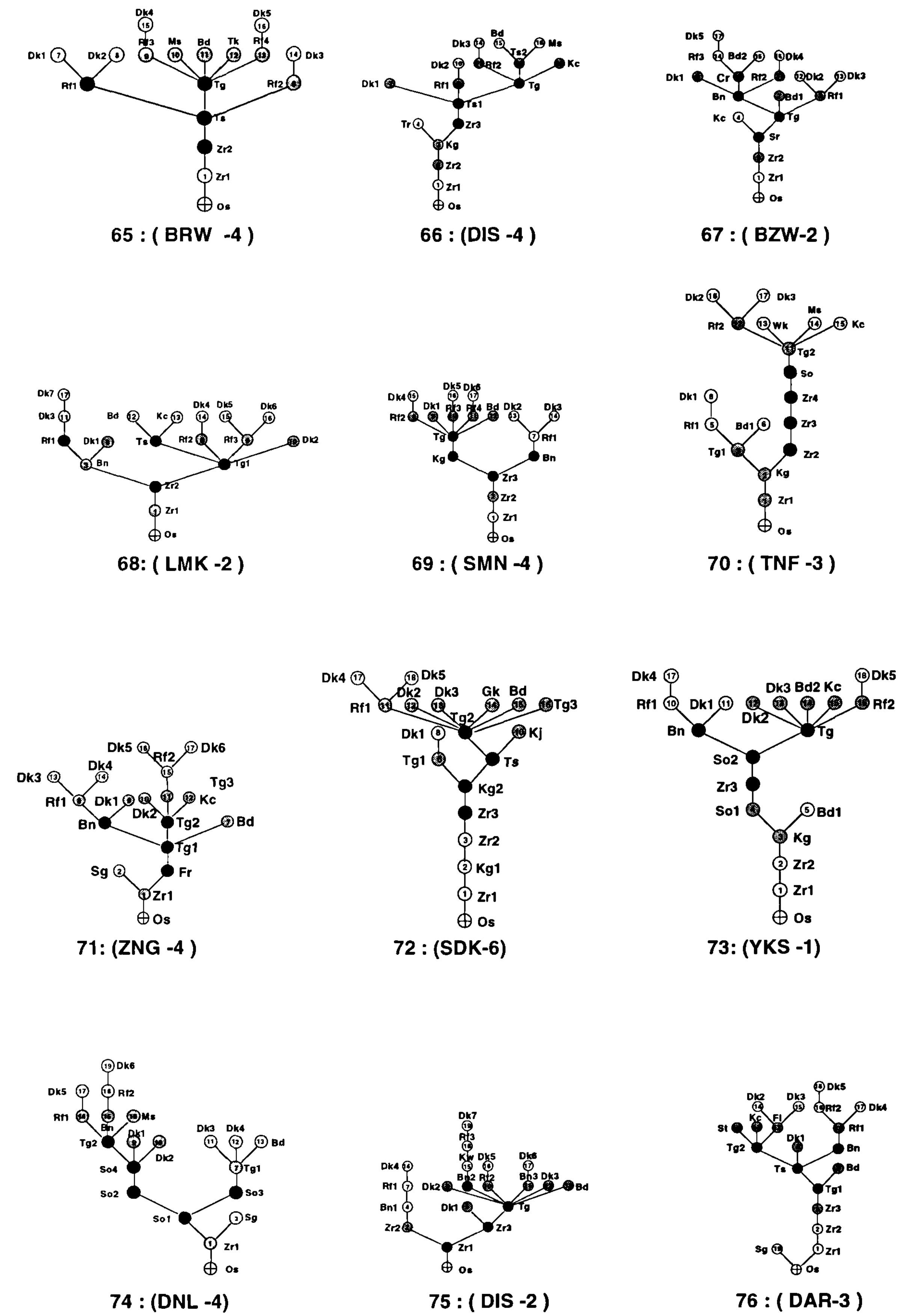
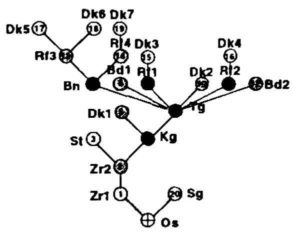
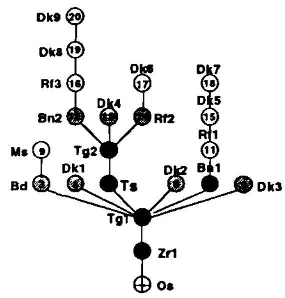


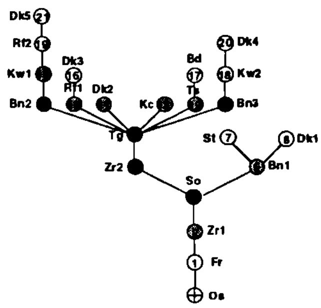
FIGURE A19.1.1e : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES



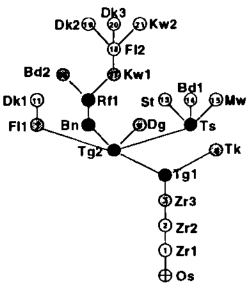
77 : (SMN -1)



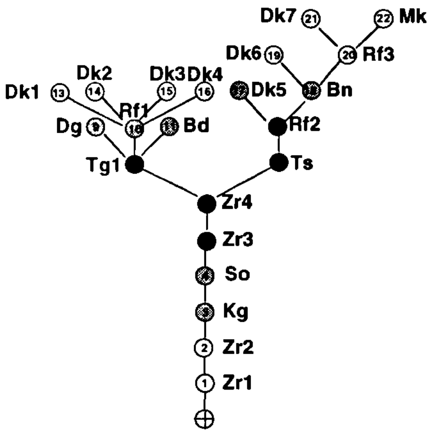
78 : (ZBR -3)



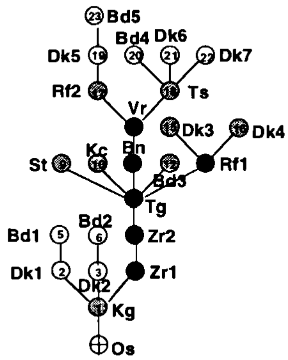
79: (LMK -3)



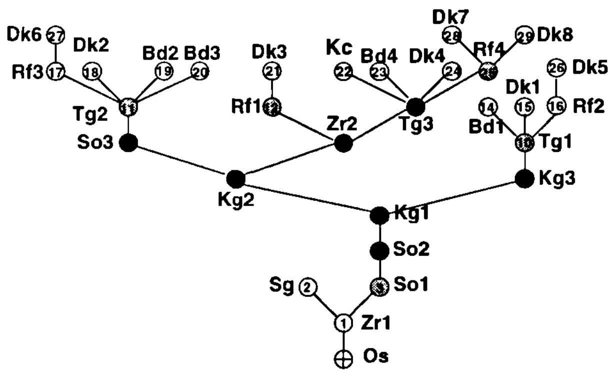
80: (SHS-1)



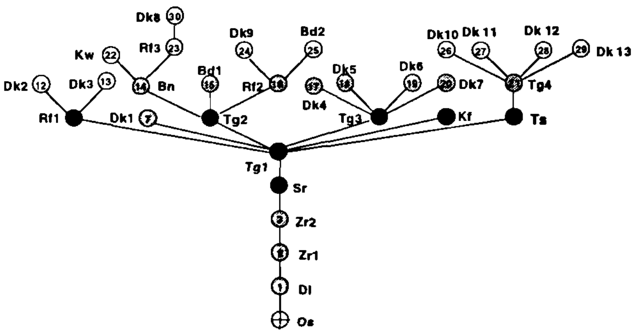
81: (SHS -5)



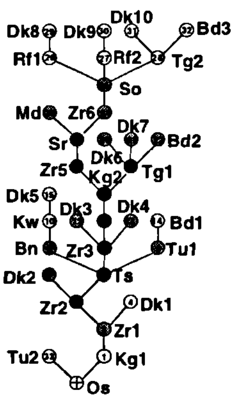
82 : (ALF-4)



83 : (MDB -1)

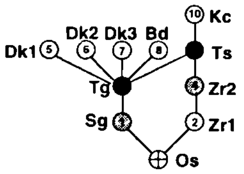


84 : (T NF- 2)

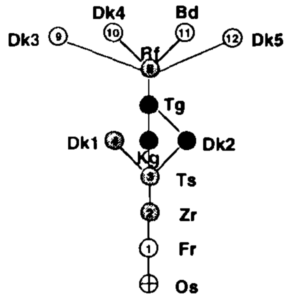


85 : (SDK-3)

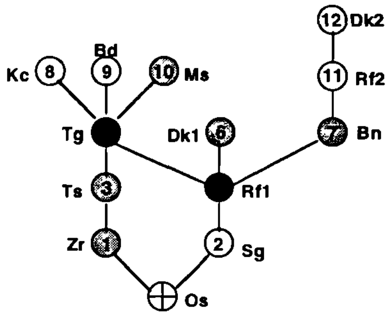
FIGURE A19.1.1f : SINGLE FAMILY (TREE- LIKE) INTEGRATION CORES



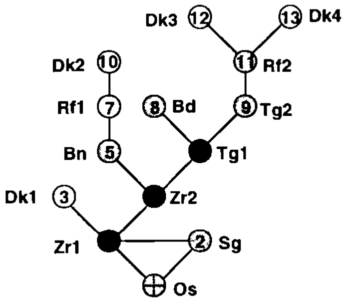
86 : (SMN -3)



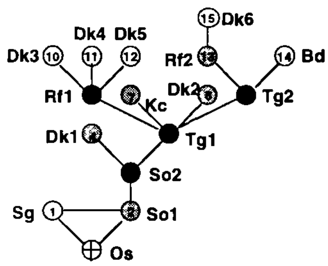
87 : (DAR- 4)



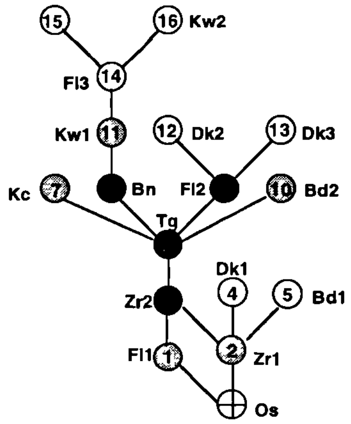
88 (MGN -2)



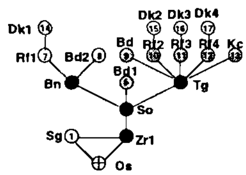
89(DKR -4)



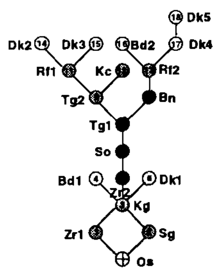
90 : (ADK -2)



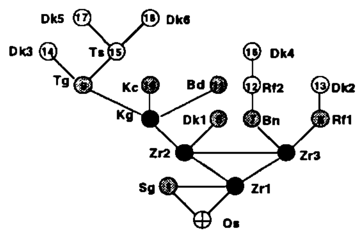
91 : (MGN -4)



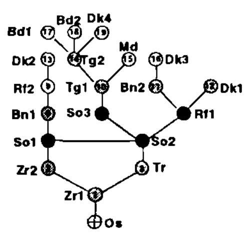
92 : (SMN -5)



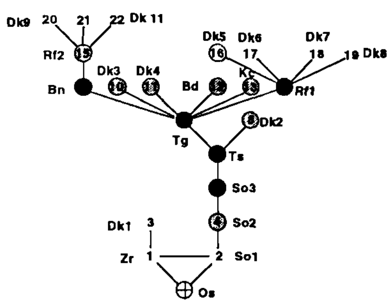
93 : (JNG -2)



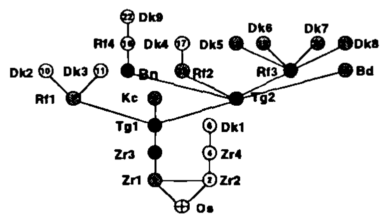
94 : (TNF -5)



95: (SHS -4)

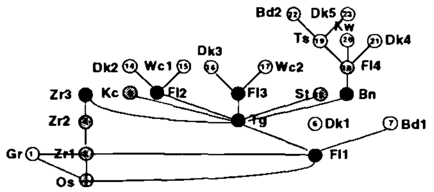


96: (DKR -1)

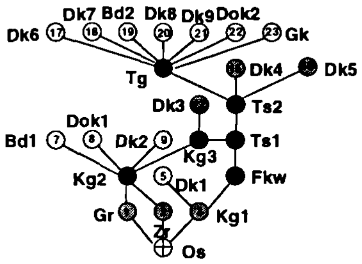


97 : (DAR - 5)

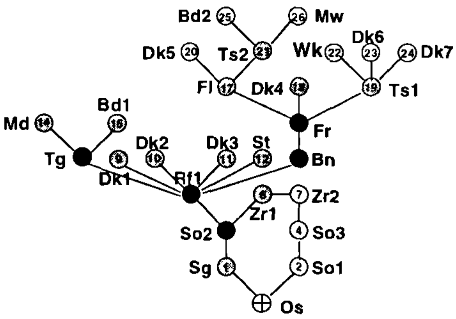
FIGURE A19.1. 2a : SINGLE FAMILY (RINGY) INTEGRATION CORES



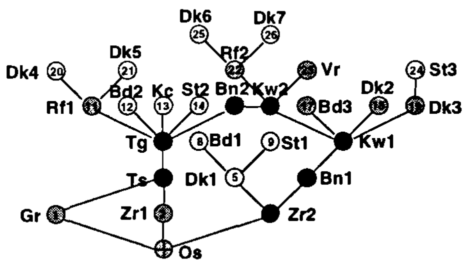
98 : (GBR-1)



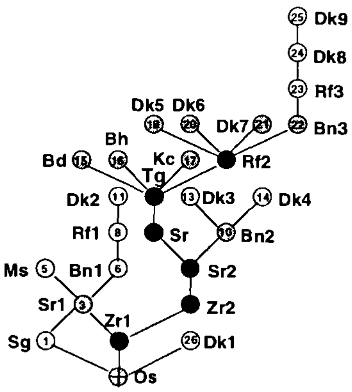
99 : (SDK-5)



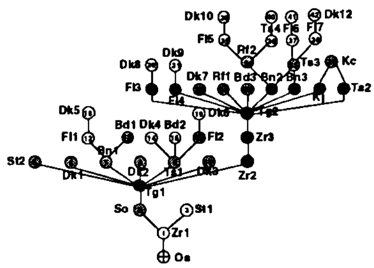
100 : (ALF-3)



101: (KOK-1)



102 : (KOK-2)



103: (UGN-2)

FIGURE A19.1. 2b : SINGLE FAMILY (RINGY) INTEGRATION CORES

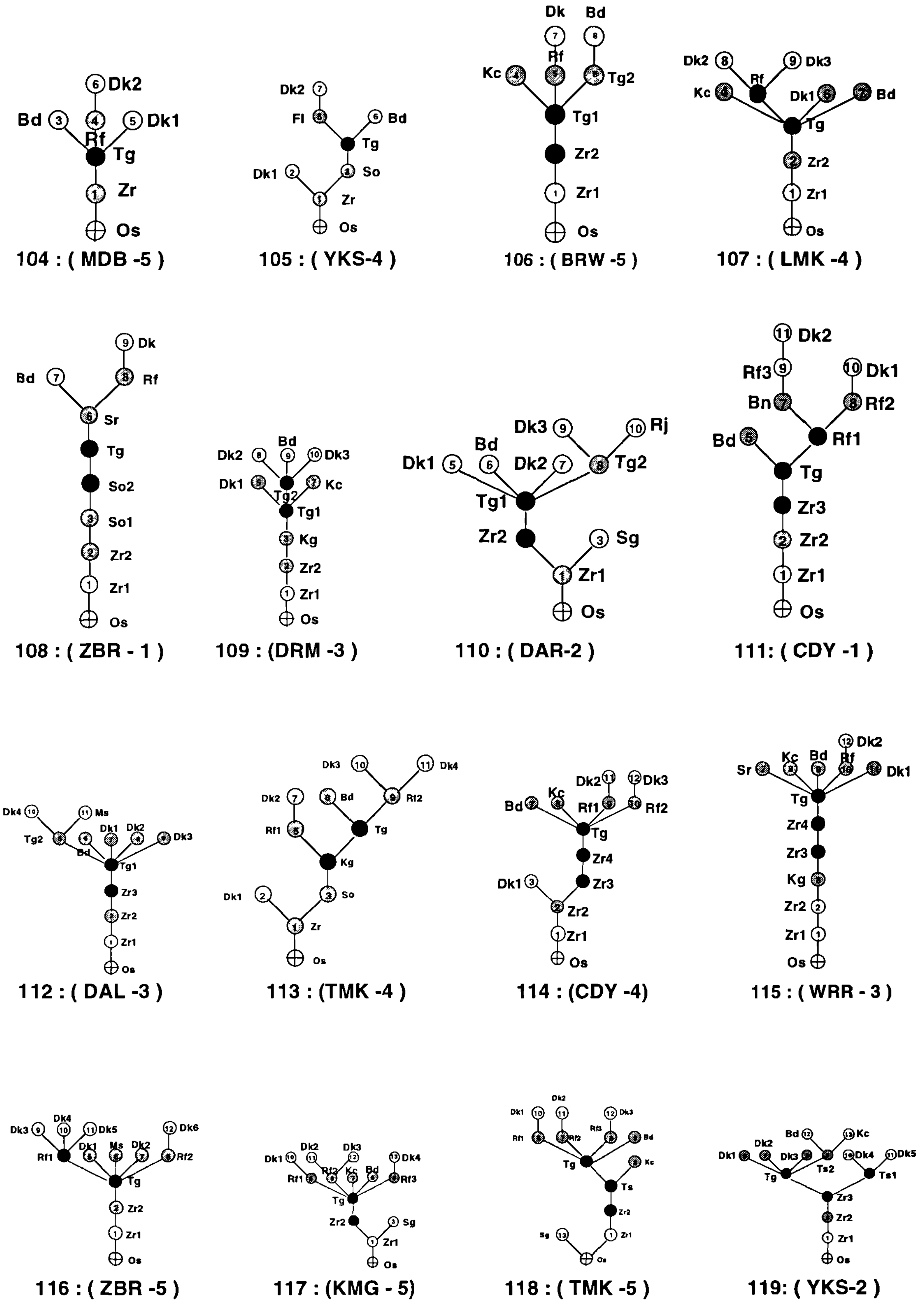


FIGURE A19. 2.1a : 2 -FAMILY (TREE -LIKE) INTEGRATION CORES

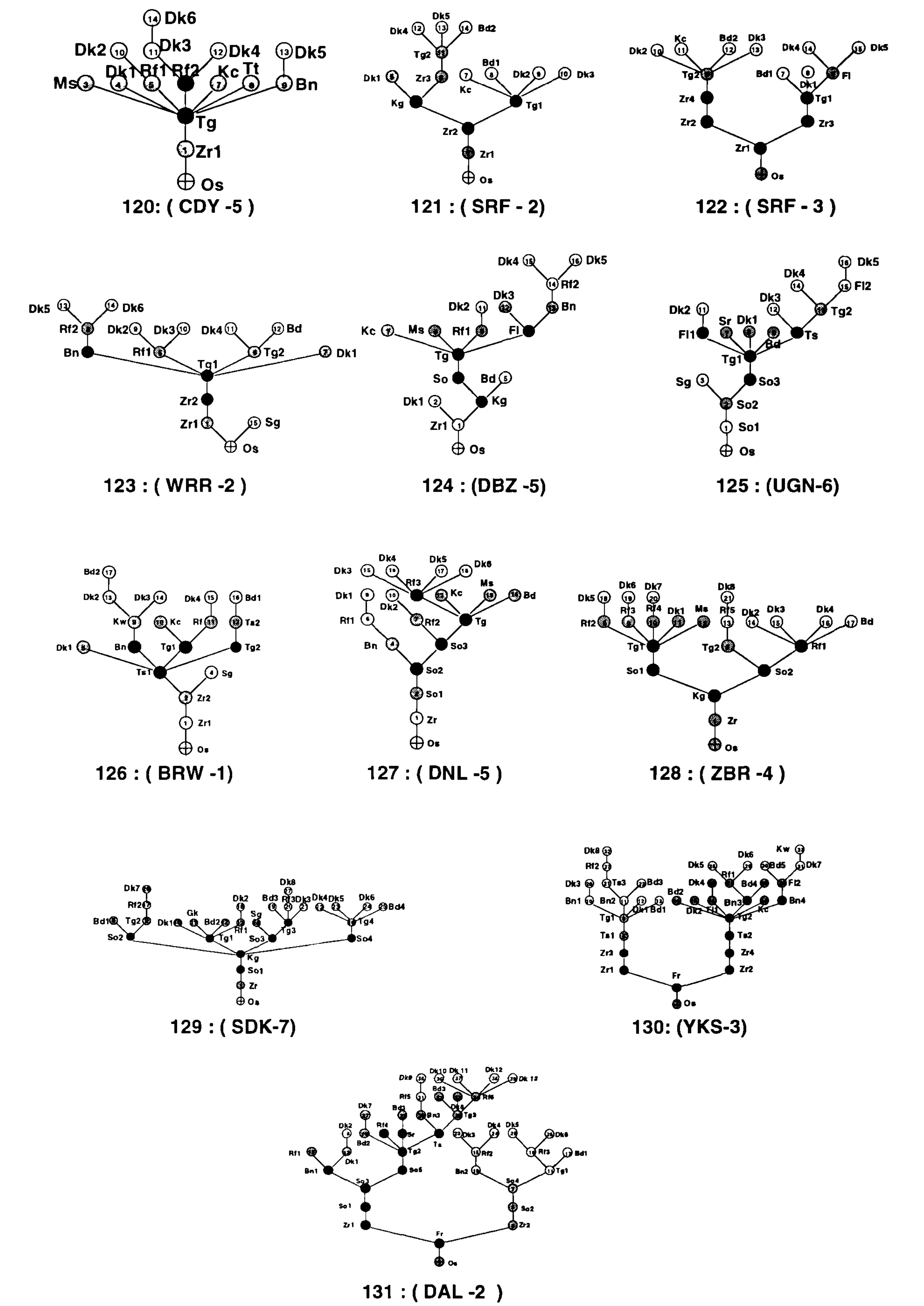
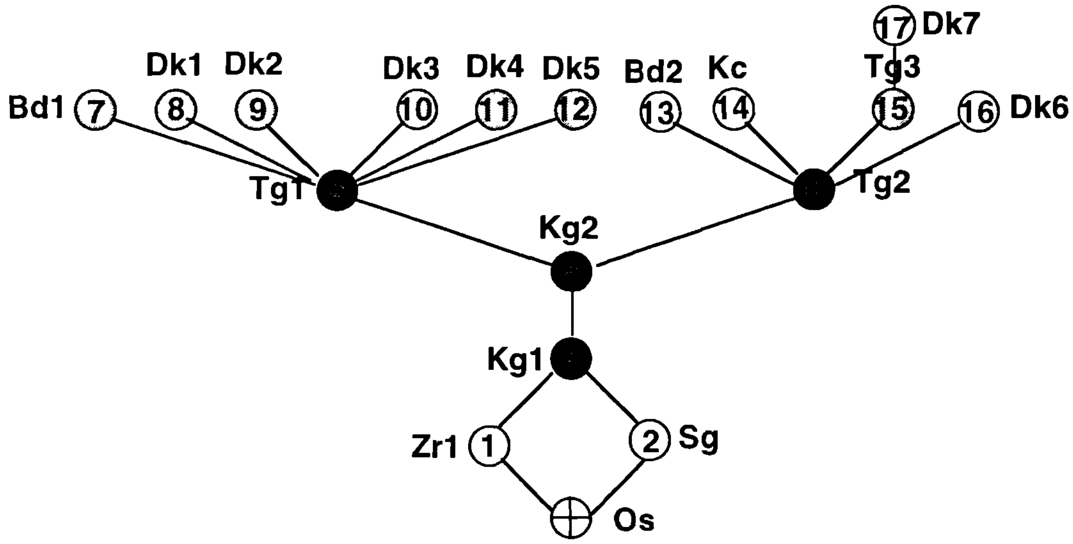
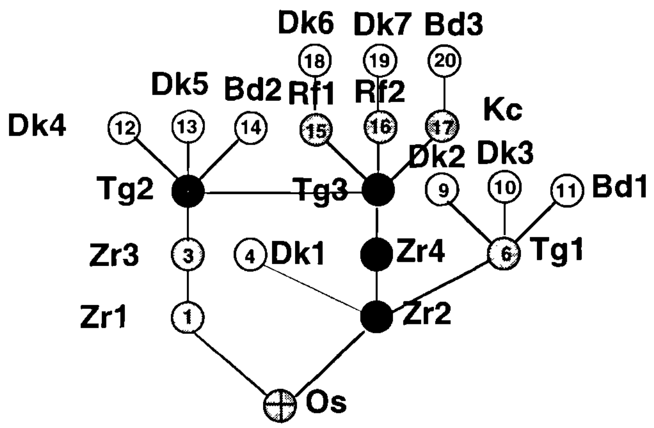


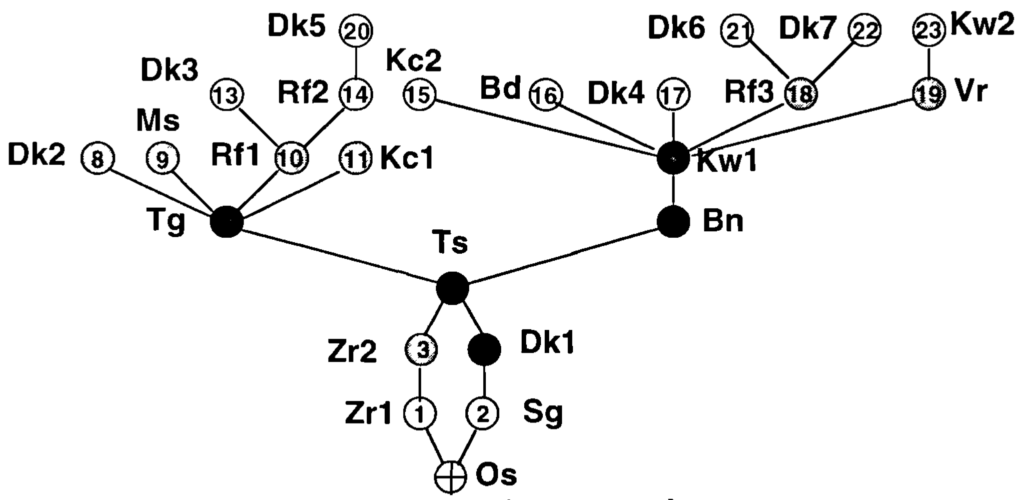
FIGURE A19. 2.1b : 2 -FAMILY (TREE -LIKE) INTEGRATION CORES



132: (LMK - 1)

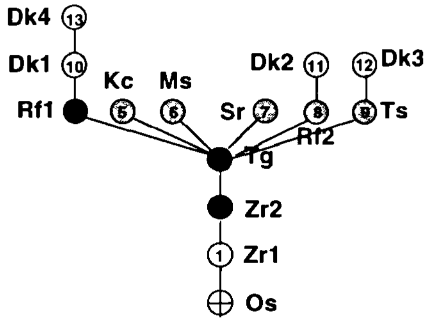


133: (ZNG-1)

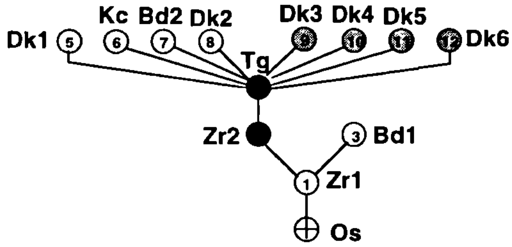


134 : (DAR-1)

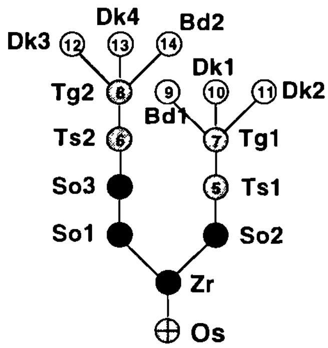
FIGURE A19. 2. 2 : 2 -FAMILY (RINGY) INTEGRATION CORES



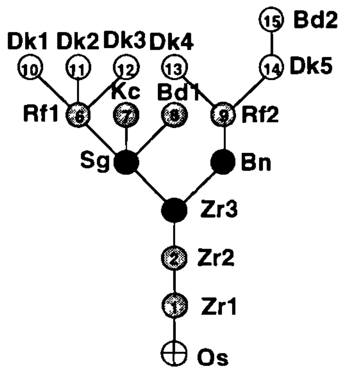
135 : (DBZ-4)



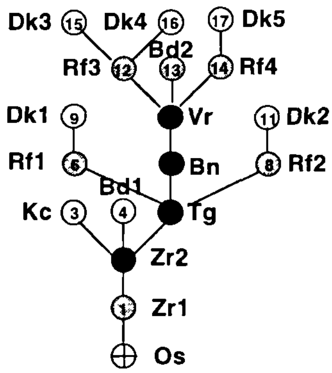
136: (UGN-8)



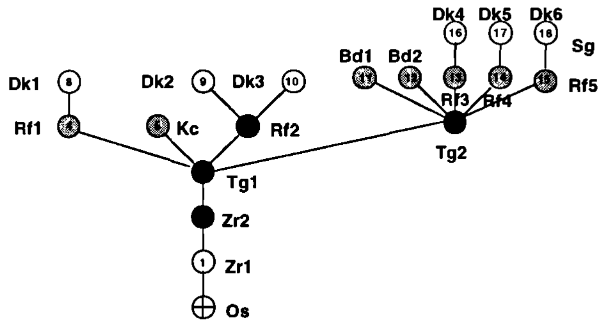
137 : (YKS -5)



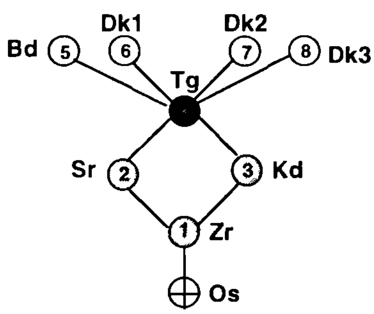
138 : (JNG -5)



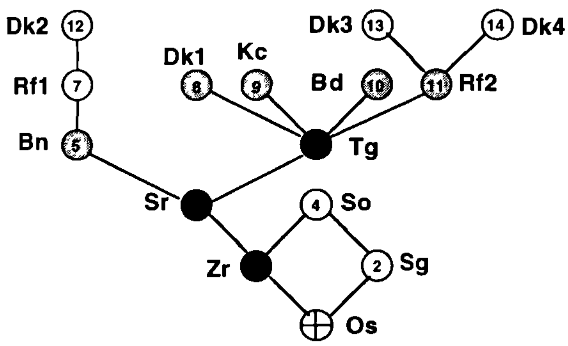
139 : (DBZ-1)



140 : (DKR -3)

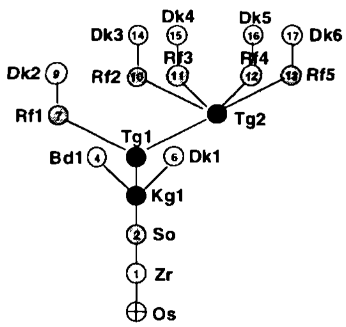


141 : (TNF -1)

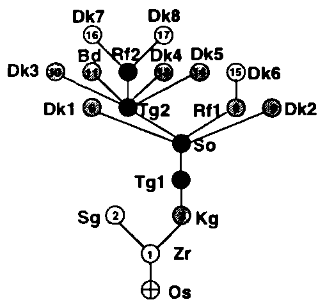


142 (DKR -2)

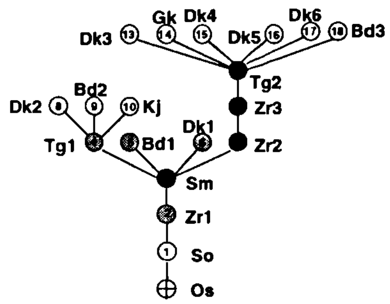
FIGURE A19. 3.1 : 3- FAMILY INTEGRATION CORES



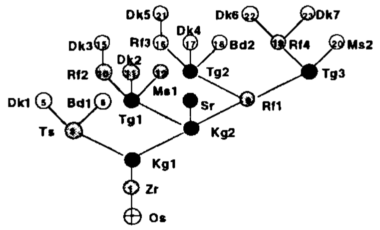
143 : (ADK -5)



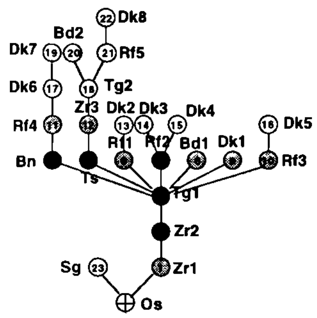
144 : (ZNG - 2)



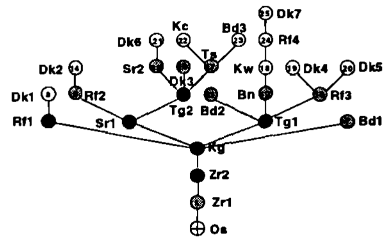
145 : (SDK- 4)



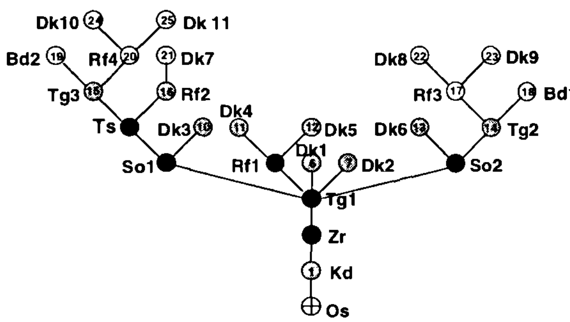
146 : (ADK -4)



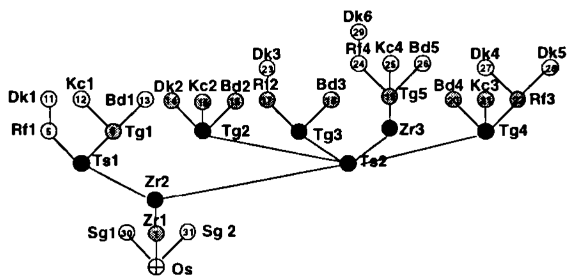
147 : (ALF-8)



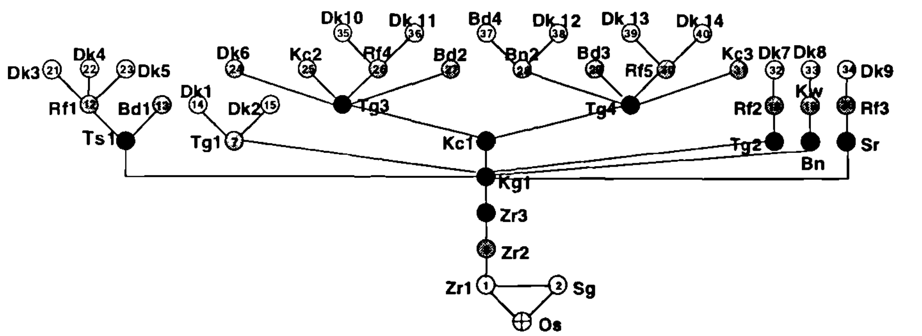
148 : (DRM-1)



149: (JNG -3)

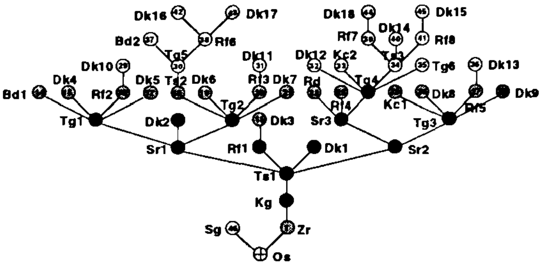


150 : (JNG - 1)

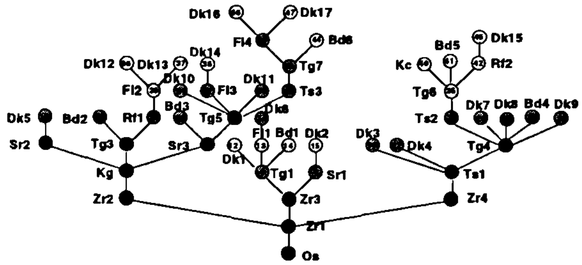


151 : (WRR -5)

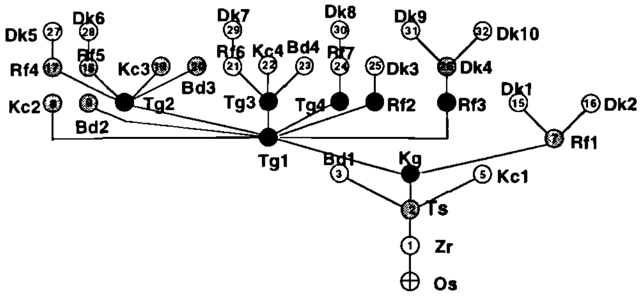
FIGURE A19. 4.1 : 4 -FAMILY INTEGRATION CORES



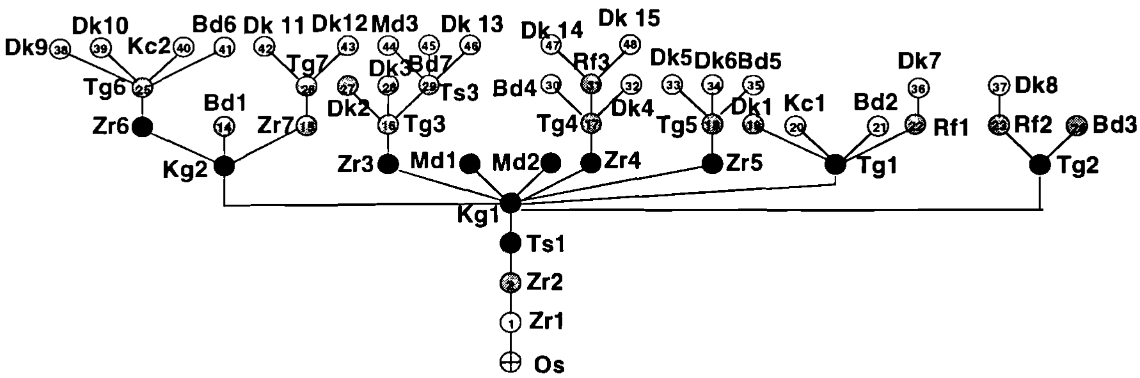
152 : (KMG - 1)



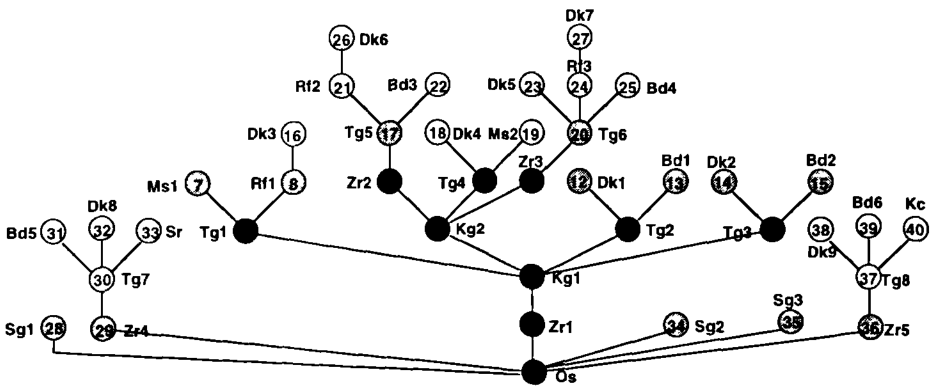
153 : (DBZ -2)



154 : (JNG -4)

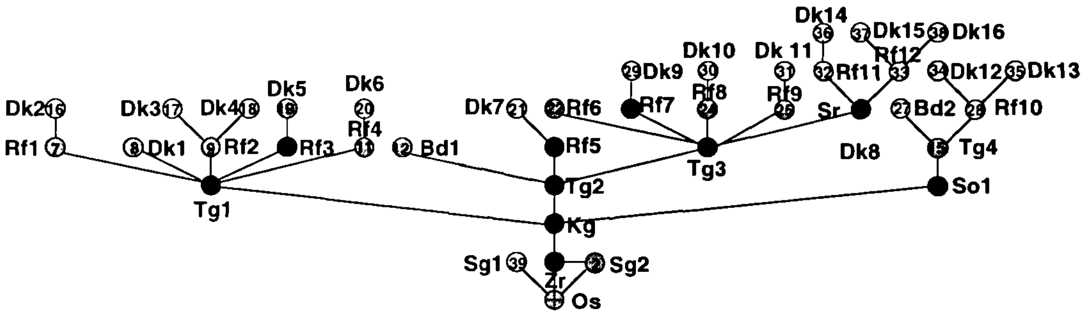


155 : (ZNG -3)

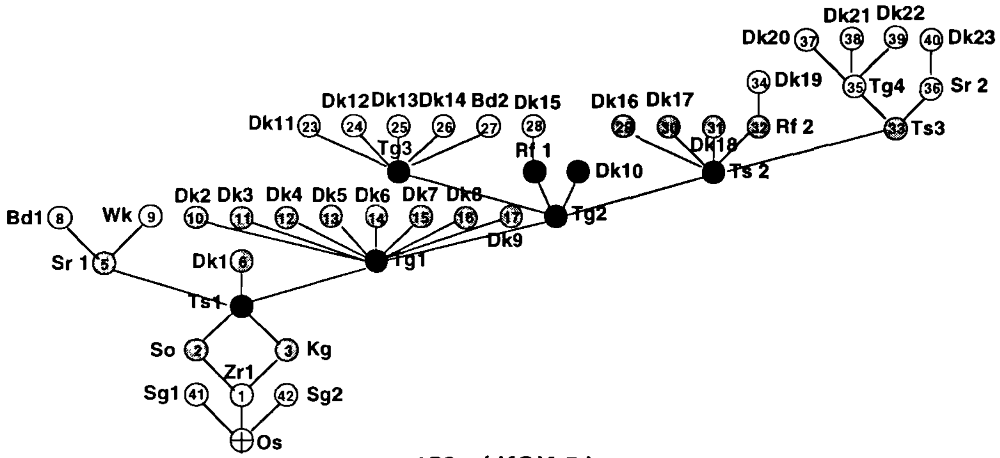


156 (DIS - 3)

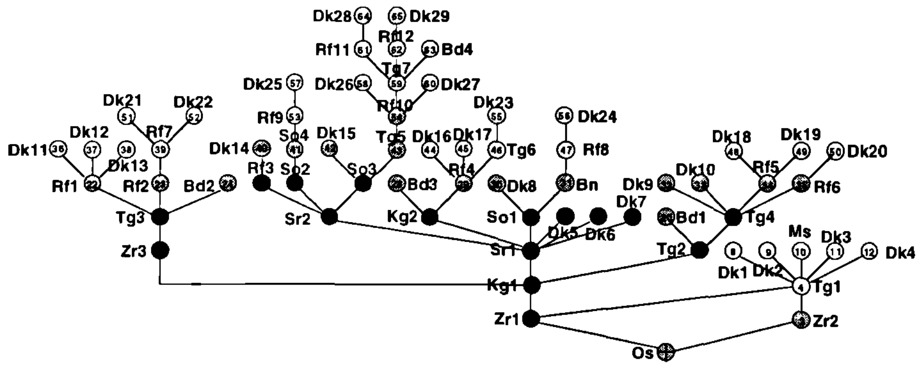
FIGURE A19.5.1a : ≥5 -FAMILY (TREE-LIKE) INTEGRATION CORES



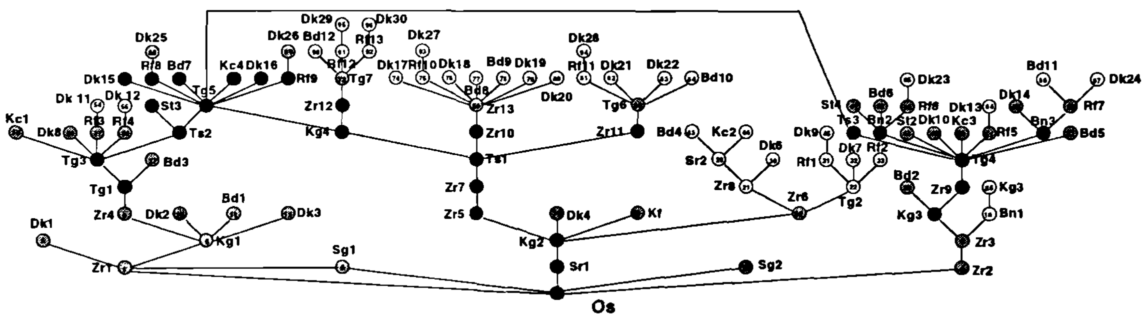
157 : (MDB -4)



158 : (KOK-5)



159 : (KMG -2)



160 : (DIS -1)

FIGURE A19.5.1b : ≥5 -FAMILY (RINGY) INTEGRATION CORES

Appendix 20 : Glossary

A. Functional Space Terms And Labels

Term	Symbol	Meaning
Banɗaki	Bd	Toilet usually with, but also without a place for bathing
Baranda	Vr	Veranda
Barga	Br	An open space after the entrance hall
Bene	Bn	Stairway
Dakali	Dl	A seating place immediately outside the house
Ɗaki	Dk	Generally a room, but usually for sleeping
Ɗakin Doki	Dok	A room for a horse
Ɗakin Girki	Dg	A room for cooking or keeping cooking utensils
Falo	Fl	An outer room
Farfajiya	Fr	An open space outside and adjacent to the house
Filin Kiwo	Fkw	An open space for exercising horses
Gareji	Gr	Garage
Kanti	Kt	Canteen
Keji	Kj	Cage for pigeons or chiken
Kicin	Kc	A room for cooking or keeping cooking utensils
Kofar Gida	Kg	An open space after the entrance hall
Kudandan	Kd	A circular entrance hall
Kwatashe	Kw	Upper storey veranda
Ma'ajiya	Mj	Store (also *sito*)
Madafi	Md	A cooking place (also *ɗakin girki*)
Madudduka	Mk	A door connecting two courtyards
Masai	Ms	Latrine (also *banɗaki & shadda*)
Mawanka	Mw	A place for body washing or bathing
Murhu	Mh	Hearth
Rumbu	Rb	A grain store
Rumfa	Rf	An outer room to a *ɗaki*
Sarari	Sr	An open space inside the house
Shago	Sg	A room accessed from the *zaure* or from outside the house
Shamaki	Sm	An open space after the entrance hall (also *barga*)
Sheka	Sk	An open space inside the house
Shigifa	Sf	An entrance hall; usually primary or secondary
Sito	St	Store (also ma'ajiya)
Soro	So	An entrance hall; usually secondary or tertiary
Tsakar gida	Tg	A courtyard or cortile
Turaka	Tr	A room , upper apartment or section reserved for the househead
Turke	Tk	Animal tether
Zaure	Zr	An entrance hall; usually primary

Appendix 20: Glossary

B. Architectural & Social Terms

Arewa	North
Aro	Term applied to a granted house for use
Azara	Deleb Palm
Bene	Upper Storey ; also staircase
Baka	The Hausa arch; also *bakan gizo*
Burgi	Square or rectangular adobe bricks using standard mold,also sun dried
Daɓe	Flooring
Dandali	An open communal field
Fada	Palace
Fangali	An open space in front of a house; also *haraba* or *farfajiya*
Fuska	Section / Sector
Gabas	East
Gida	House; household (pl *Gidaje*)
Kasuwa	Market
Kofa	Major city gate
Kudu	South
Kulle	Strict observance of sex segregation; also Purdah
Lungu	A cul-de-sac
Maigida	Senior man in charge of a house
Makuba	A waterproof wall finish
Masallacin Jumu'a	Main Friday Mosque
Rariya	A minor road
Sana'a	Trade or profession
Sarki	King; also leader or chief
Sashe	Self-contained family section of a large house (Also *waje*)
Tajiri	High income earner; also successful merchant
Talaka	The low income members of the society; Also the non-political office holders
Titi	A main thoroughfare
Tubali	Conical hand moulded, sun dried adobe brick
Unguwa	Ward
Uwargida	Senior housewife
Waje	Self-contained family section of a large house (Also *sashe*)
Yamma	West

APPENDIX 16 : LIST OF FIELD ASSISTANTS

1. *Mallama* Amina Garba
2. *Mallama* Binta Ahmed
3. *Mallama* Binta Musa
4. *Mallama* Hasana Ibrahim *
5. *Mallama* Maimuna Baƙo *
6. *Mallam* AbdulRashid Sani
7. *Mallam* AbdulRazak Shehu *
8. *Mallam* AbdulSalam Ya'u Dawakiji
9. *Mallam* Aliyu Hassan Shawai
10. *Mallam* Bashir Ibrahim
11. *Mallam* Ilyasu M Awwal
12. *Mallam* Isa Bala Haruna *
13. *Mallam* Isma'ila Garba Haɗejia
14. *Mallam* Mahmoud Mansur
15. *Mallam* Nasiru Musa *
16. *Mallam* Rabi'u Mohammed
17. *Mallam* Sani Wali Daneji

All Students of the School Of Architecture Kano State Polytechnic, at the time of Field work.

{ * Indicates Part-time Field Assistants }

APPENDIX 22 :ACKOWLEDGEMENT LIST

NIGERIA

Alhaji Adamu Vice Muhammad (Late)

Alhaji Husaini Wambai

Alhaji Jibrin Fari

Alhaji Magaji Wakilin Kudu

Alhaji Muhammad Muhammad (Late)

Alhaji Muhtari Cedi Wakilin Gabas

Alhaji Sani Buhari Daura

Arc. Ibrahim Haruna

Arc. Kabir Galadanci

Arc. Muhammad Ahmad

Arc. Sabo Garba (Late)

Arc. Sagab Ahmed

Brig. Baiyeroju

Captain Mohammed Joji

Col. I Karmashe

Col. Muhammad Wase (Late)

Col. N Bamalli

Cpl. Raphaeal

Cpl. Shehu Sokoto

Dr. Mansur Ibrahim Muhktar

Dr. Muhtari AbdulKadir

Dr. Philip Shea

Gen. Ibrahim Babangida

Gen. Salihu Ibrahim

Hajiya A'isha Wada

Hajiya Safiya Bello Daura

Hajiya Umma Dantata

His Highness Alhaji Ado Bayero

Lt-Col. SU Atawodi

Madakin Kano

Maj-Gen. A Kazir

Maj-Gen. C Iweze

Maj-Gen. EB Opaleye

Maj. AA Samba

Maj. David Apochi

Maj. O. Bello

Maj. William Udofia

Mallam Abubakar Aliyu Darma
Mallam AU'Dan'Asabe
Mallam'Dayyabu Gano
Mallam M Hamza (Director School Of Technology)
Mallam Muhammad'Danyaro
Mallam Muhammad Liman
Mallam Muhammadu Sani Ibrahim
Mallam Wakili Yahaya
Mr. J Lavers (Late)
Mr. Yusuf Abdullateef Ahmed
Mrs. A'isahtu (Ladi) Bello Daura
Sqn Ldr. M. Rano.
Turakin Kano
Wakilin Arewa
Wakilin Yamma
Wng. Cmdr I Komo
GREAT BRITAIN & ELSEWHERE
Dr. AbdulMalik Osman
Dr. Amr El-Ghohary
Dr. Ben Croxford
Dr. Farida Nilufar
Dr. Hassan El Shamahy
Dr. Isma'il Ayen
Dr. Isma'il Rahmat
Dr. Jorge Ricardez Esquinca
Dr. Lena Tsokunogoulou
Dr. Mansur Mukhtar'Dambatta
Dr. Muhammad Salisu Adaya
Dr. Murray Last
Dr. Philip Jaggar
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بسم الله الرحمن الرحيم

قال رب إني أعوذ بك أن أسألك

ما ليس لي به علم وإلا تغفر لي وترحمني

أكن من الخاسرين

He (Noah) Said: My Lord I Seek Refuge In You
(From The Sin) That I Should Ask You
That Which I Have No Knowledge Of.
For Indeed If You Forgive Me Not,
And Have Mercy On Me, I Will Indeed
Be Among The Losers (And The Astray)!

Qur'an 11:47